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U.S. Army Toxic and Hazardous Materials Agency

ENHANCED PRELIMINARY ASSESSMENT REPORT:

JEFFERSON PROVING GROUND MADISON, INDIANA

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An enhanced preliminary assessment of Jefferson Proving Ground was performed to characterize the environmental impacts of actions occurring at the property, and to provide a basis for the development of remedial actions. Characterization was performed through examination of site activities, determination of the quantity of hazardous substances present, and evaluation of the potential pathways for contamination migration which would affect public health and the environment. Thirty-six solid waste management units and sixteen other areas requiring environmental evaluation were investigated. Recommendations for additional studies, sampling, and actions are contained in the summary. Actions include deliniation of the actual limits of several waste disposal sites; installation of ground water monitoring wells; sampling of soils, surface and ground water; location of waste disposal areas; location of unexploded ordnance; and surveying of buildings for radon, asbestos, and lead paint.

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Enhanced Preliminary Assessment Report
for
Jefferson Proving Ground,
Madison, Indiana

EXECUTIVE SUMMARY

The results of the enhanced preliminary assessment conducted by Ebasco Environmental, through the Argonne National Laboratory, at Jefferson Proving Ground, Madison, Indiana are presented in this report. In order to characterize the environmental impacts of actions occurring at the property, and to provide a basis for the development of actions to remediate releases of hazardous substances, preliminary assessments of federal facilities are being conducted. The objective of the enhanced preliminary assessment is to adequately characterize the site to determine the need for further action prior to base closure. Characterization is performed through examination of site activities, determination of the quantity of hazardous substances present, and evaluation of the potential pathways for contamination migration which would affect public health and the environment.

Jefferson Proving Ground is a 55,265-acre site in southeastern Indiana, north of Madison, and is located in Ripley, Jennings, and Jefferson Counties. Based on the evaluation of the historical and current practices, Jefferson Proving Ground potentially contains unexploded ordnance virtually anywhere onsite. Additional investigation and environmental characterizations will be required in many areas of JPG. A summary of the areas requiring environmental evaluation (AREEs), including a description, suspected contaminants, conclusions and recommendations is contained in the following tables.

AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY TABLE

South of the Firing Line (West Side)

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Old Incinerator	JPG-001	Used to burn paper products, debris and small ammunition from the installation	Particulate matter, fuel oil	Air	Soil	This unit is not active; no current migration pathways	Soil sampling around building
Water Quality Lab	JPG-002	Operational at the STP since the 1960's; laboratory analysis includes flow, pH, BOD, suspended solids, fecal coliform, and residual chlorine	Waste chemicals		Soil	Sewer improvement programs and SOPs prevent contaminant releases	Soil sampling around the building;wipe samples of HVAC system/drains; chip sampling
Sewage Treatment Plant	JPG-003	Used for the primary and secondary treatment of wastewater at the installation; sludge is dried on the sludge drying bed and disposed of off post; wastewater is tested to confirm compliance with NPDES permit limitations	Liquid stream discharges and dry sludge material		Soil, Surface water	Sampling of sludge does not indicate contamination with silver (Ag)	Soil sampling
Burning Ground	JPG-004	Area once used for the open burning of explosives; dates of use unknown; currently overgrown with vegetation and not in use	TNT, DNT, heavy metals and solvents	Air	Soil	Potential migration pathway by leaching of contaminants through soils; no evidence of a release observed	Soil sampling
Landfill	JPG-005	1-acre landfill comprised of small filled-in trenches; depth unknown; used for dumping of film refuse from the photographic lab	Film (silver), solvents and lead		Soil	Potential migration pathway by leaching of silver and solvents through soils	Geophysical screening; soil sampling to the base of the landfill
Wood Storage Pile	JPG-007	Waste pile used for the storage of non-hazardous wood debris	None			Wood is on impermeable runway; wood is inert, non-hazardous; has no ability to migrate	
Contaminated Wood Storage Pile	JPG-008	Waste pile used for the storage of PCP-contaminated wood debris	PCP			Wood is stored on an impermeable runway; no distressed vegetation observed; current exposure potential is low	

AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY TABLE

South of the Firing Line (West Side); Continued

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
New Incinerator	JPG-011	Utilized to incinerate solid waste consisting of paper product, debris, and inert munitions chemical components	Contaminants in ash	Air		The potential contaminant release mechanism is limited to air transport due to emissions from the incinerator	Soil sampling around the building
Fire Training Pit	JPG-030	Unlined open pit used for fire training purposes; wood debris is soaked with used diesel fuel and POL products and ignited	Heavy metals and petroleum products	Soil Air		The potential contaminant release mechanisms include migration through surface soils to ground water; an oily sheen was observed; residue coating of waste POL products on soils	Soil sampling
Temporary Storage (Building 305)	JPG-036	The site has been utilized since 1980 for the temporary storage of hazardous waste material prior to pick-up and removal by DRMO	Spills from stored material		Soil	All of the wastes are properly containerized or bagged; potential for migration or dispersal is limited; no evidence of release to the environment	Soil, wipe and chip sampling
UXO Contamination	NA	The area south of the firing line potentially contains significant amounts of UXO; contamination can most likely be attributed to the rocket, mine, and armor plate testing and ammunition dumping during the WWII era	Heavy metals, physical and chemical hazard		Soil, Ground water	The potential contaminant release mechanism includes leaching of metals and HE components through soils	Location of areas containing UXO, soil sampling
Possible Sulfur Disposal Area	NA	Area used for the disposal of yellow sulfur-like material	Unknown	Soil	Surface water	The potential contaminant release mechanism includes migration of yellow material through soils, and runoff into surface waters	Soil, water and sediment sampling
Burn Area	NA	A concrete pad and surrounding grassy area appeared to be the site of burning activity; no additional information on this area is available	Unknown		Soil, Surface, Ground water, Air	The potential contaminant release mechanism includes migration of black residue through soils to ground water and runoff into surface water	Soil and surface water sampling

AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY TABLE

South of the Firing Line (East Side)

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Open Burning Area	JPG-022	Thermal treatment area operating under a RCRA Interim Permit; four burning trays are utilized at this site for burning of waste and unused/unusable propellant deemed unsafe to dispose with incineration	EP Toxicity metal, explosive residue	Air	Soil	The potential contaminant release mechanisms include air transport and leaching of contaminants through soils to GW; the effectiveness of the containment device, location of the burn area, and the SOPs combine to minimize contact between waste ash and the environment; no evidence of release to soil was observed, however burning occured here prior to installation of the trays	Soil sampling
UXO Contamination	NA	The area south of the firing line reportedly contains significant amounts of UXO; contamination can most likely be attributed to the rocket, mine, and armor plate testing and ammunition dumping during the WWII era	Heavy metals, in addition to significant physical and chemical hazards		Soil, Ground water	The potential contaminant release mechanism includes leaching of metals through soils	Location of ordnance materials; soil sampling
Gator Mine Testing Area	NA	This area is used for the testing of mines	Heavy metals, explosive residues		Soil, Surface, Ground water	The potential contaminant release mechanism includes leaching of contaminants through soils	Removal of ordnance materials; soil, surface and ground water sampling
Gator Mine Burn Area	NA	Scrap wood, wire, and plastic is periodically burned at this area	Heavy metals		Soil Air	The potential contaminant release mechanism includes leaching of contaminants through soils	Soil sampling

AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY TABLE

Firing Line Area

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Red Lead Disposal Area	JPG-009	Reportedly used for the disposal of paint residuals (red lead), and lead oxides used in inert rounds; size and dates of use unknown; site location unknown	Lead		Soil, Surface, and Ground water	Previous studies have indicated that this area is a potentially hazardous waste disposal site; potential contaminant release mechanisms are unknown	Locate the disposal area; soil, surface water, and ground water sampling
Photographic Laboratory	JPG-010	Processes, develops, and prints large quantities of black and white/color film; waste toner is diluted and discharged through a floor drain to the sanitary sewer system; two silver recovery units are in place	Silver, waste toner and developer		Soil	Heavy metals normally bond to organic material in soils and clay and do not migrate appreciable distances unless under acidic conditions; the waste toner and developer drained into the sewer system has little migration potential; the potential for migration into ground or surface water is minimal	Wipe samples of drains, HVAC; sample soils surrounding the building; chip sampling
Indoor Range	JPG-012	Utilized to test small arms for training until the early 1980's; area closed due to concern over interior contamination with lead oxides and lead dust derived from lead bullets used in the range	Lead oxides and lead dust		Soil, Air, Building interior	The potential migration pathways include the presence of lead in soils, on interior building surfaces, and lead dust in the air	Soil sampling for lead; wipe sampling of interior surfaces; air sampling inside the building
Munitions Demilitarization	JPG-013	Reportedly used for the demilitarization of munitions; size and dates of use are unknown; locations are unknown	Heavy metals, DNT, TNT		Soil, Ground water	Previous studies indicate that the area is a potentially hazardous waste diposal site;	Locate the disposal area; soil, surface water, and ground water sampling
Solvent Pit (Building 602)	JPG-027	Utilized as a surface disposal area from 1970 to 1978 for the dumping of TCE solvent and degreaser, other unknown solvents for percolation; pit no longer used	TCE and other solvents	Soil	Ground water	TCE and other solvents have the ability to migrate, creating a high potential for ground water contamination; soil sampling indicated VOC contamination; the lateral extent of contamination is expected to be localized in the immediate vicinity impact on ground water unknown	Install ground water monitoring wells; sample ground water

AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY TABLE

Firing Line Area; Continued

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
(Building 617)	JPG-028	Utilized as a surface disposal area from 1970 to 1978 for the dumping of TCE solvent and degreaser, and other unknown solvents for percolation; pit no longer used	TCE and other solvents	Soil	Ground water	TCE and other solvents have the ability to migrate, creating a high potential for ground water contamination; soil sampling indicated VOC contamination; the lateral extent of contamination is expected to be localized in the immediate vicinity; impact on ground water unknown	Install ground water monitoring wells; sample ground water
Solvent Pit (Building 279)	JPG-029	Utilized as a surface disposal area from 1970 to 1978 for the dumping of TCE solvent and degreaser, and other unkown solvents for percolation; pit no longer used	TCE and other solvents	Soil, Ground water		TCE and other solvents have the ability to migrate creating a high potential for ground water contamination; soil sampling indicated VOC contamination; VOC contamination has been found in one downgradient well; non-detection in two wells further downgradient may indicate that no significant migration has occured	Re-sample ground water monitoring wells; evaluate need for additional wells
Temporary Storage, Machine Shop (Building 105)	JPG-031	Used since 1970's for the temporary storage of varying amounts of waste fluids such as cutting oil, cooling fluids, and naphthalenic waste fluids stored in 55 gallon drums prior to removal by DRMO	Naphthalenic oils		Soil	No evidence of a release exists at this location; napthalenic oils are suspected carcinogens and are considered hazardous when spent; waste fluids cannot migrate beyond the shop unless there is an uncontrolled spill in the doorway; exposure potential is low to minimal as the only hazard is to workers handling waste oil and fluid drums	Soil and chip sampling

AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY TABLE

Firing Line Area; Continued

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Assumed Temporary Storage	JPG-032	Reportedly used as a storage area; size of the area, and possible source materials are unknown	Unknown			The potential contaminant release mechanisms are unknown	Define and locate the site
Assumed Temporary Storage	JPG-033	Reportedly used as a storage area; size of the area, and possible source materials are unknown	Unknown			The potential contaminant release mechanisms are unknown	Define and locate the site
Temporary Storage, Weapons Maintenance (Building 227)	JPG-034	Warehouse used for repairing and refurbishing gun tubes and other weapons and weapons parts; also utilized for storage of waste solvent and oil; when full, the drums are picked up by DRMO	Solvents and waste oil		Soil	The solvents and waste oil have the potential to migrate into the shallow surface deposits and shallow ground water in the event of a spill; minor spillage has occured during handling of the drums	Soil and chip sampling
Temporary Storage, Motor Pool (Building 186)	JPG-035	Warehouse used as a maintenance garage for repairing heavy equipment and vehicles; also utilized for temporary storage of solvent, No. 1 fuel oil, undrained batteries, light/heavy scrap metal storage containers; oil separator pits	Solvents and waste oil		Soil	The solvents and waste oil have the potential to migrate into the shallow surface deposits and shallow ground water in the event of a spill; minor spillage has occured during handling of the drums	Sample surrounding soils
Ammunition Assembly Area	NA	Several buildings at JPG are utilized for assembly of munitions	Explosive residue		Air, Building interior	Various projectiles are assembled in strict accordance with safety protocols; the possibility exists that explosive residues are present on building surfaces and HVAC systems	Wipe sampling of building surfaces and HVAC systems; Flame test of cracks and crevices

AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY TABLE

North of the Firing Line

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Explosives Burning Ground	JPG-006	Thermal treatment area previously used for the open burning on the ground of powdered explosives; area no longer used	TNT, DNT, metals	Air	Soil, Surface, and Ground water	Black residue present on the surface; there is no trace of open burning on the ground; the potential contaminant release mechanism is migration through soils to ground water	Soil, and surface water sampling
Ordnance Disposal Site	JPG-016	Previously utilized for disposal of munitions-related components, including chemical explosives; area consists of a water-filled pit which contains ordnance	Lead, chrome, TNT, DNT		Soil Water	It is unknown if the shells are explosive or not; lead, chrome, TNT and DNT have the ability to leach into the surrounding soils; physical hazards are of most concern	Soil and surface water sampling
Landfill	JPG-017	Abandoned landfill of unknown depth; utilized from 1960 - 1981 for burial of inert munitions; buried wastewater-filled pits containing inert shells make up the 8-acre site	Metals, explosives residuals		Soil, Ground water	The metal parts may contain explosives or other hazardous constituents; metals can migrate over time; ground water is relatively shallow and may be a release pathway to the environment	Geophysics to determine the extent of the landfill, soil and ground water sampling
Abandoned Well Disposal	JPG-018	Abandoned water well used for the disposal of munitions-related materials; 100 - 200 riot control grenades were dumped into this farm well; ammunition can be seen in the vicinity of the well	Metals, explosives		Ground water	It is unknown whether the shells are explosive or not; riot control agent (CS/CN) if released will hydrolize while ignitor/pyrotechnic mix and metals may leach into the ground water as there is direct contact	Sample ground water
Munitions Test Pond	JPG-019	Previously used sediment bottom munitions test pond; pond drained and no munitions found; pond has refilled with water	UXO, metals, explosives		Soil, Sediment, Water	It is unknown if UXO is located beneath the Macadam liner; lead, chrome, TNT, and DNT may migrate into soils	Sample sediment, and water; geophysical survey to locate UXO

AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY TABLE

North of the Firing Line; Continued

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Macadam Lined Test Pond	JPG-020	Reported to be contaminated with munitions and the herbicide Ureabor; this pond is presently dry	UXO, metals, explosives		Soil, Water	It is unknown if the shells are potentially explosive; lead, chrome, TNT, and DNT may leach into surrounding soils	Geophysical survey to locate UXO; sample soil under and around pond
Abandoned Well/ Cistern Disposal	JPG-021	Abandoned water well used for the disposal of fuses, repeated attempts to locate the well/cistern have failed	Metals, explosives		Ground water	It is unknown whether the fuses are explosive or not	Locate well/cistern; ground water sampling
Open Detonation Area	JPG-023	Thermal treatment area operating under a RCRA Interim Status Permit for open and above ground detonation; open burning occurs in a heavy steel mesh burning cage	Metals, TNT, DNT	Air	Soil	Leaching of metals, propellants, and explosives are included as potential migration pathways	Soil sampling; sampling of the seeps down slope of the detonation area
Landfill	JPG-024	Abandoned landfill of unknown depth used for the disposal of solid waste from the Old Timber Lodge; waste includes putrescibles, paper and other types of solid waste	Leachate		Soil, Ground water	The wastes buried have potential to migrate into the soils and ground water; no evidence of leachate or other releases exist at this site	Locate limits of landfill; sample soil, ground water and surface water
Landfill	JPG-025	Abandoned landfill of unknown depth used for the disposal of solid waste and construction debris; waste includes putrescibles, paper and other types of solid waste	Leachate		Soil, Ground water	The wastes buried have potential to migrate into the soils and ground water; no evidence of leachate or other releases exist at this site	Locate limits of landfill; sample soil, ground water and surface water
Landfill	JPG-026	Abandoned landfill of unknown depth used for the disposal of solid waste and construction debris; waste includes putrescibles, paper and other types of solid waste	Leachate		Soil, Surface, Ground water	The wastes buried have potential to migrate into the soils and ground water; no evidence of leachate or other releases exist at this site	Locate limits of landfill; sample soil, ground water and surface water

AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY TABLE

North of the Firing Line; Continued

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
UXO Contamination	NA	The area north of the firing line contains significant amounts of UXO; approximately 8600 acres have been utilized as designated impact or target areas; approximately 50,000 acres are suspected of being contaminated with UXO	Metals, physical hazard; explosives hazard		Soil, Surface, Ground water	The potential contaminant release mechanism includes migration of contaminants through soils into surface and ground water; explosive hazard0	Location of all ordnance materials; soil, surface and ground water sampling
Depleted Uranium Area	NA	More than 60,000 kg of low-level radioactive depleted uranium penetrators were fired on a 2-sq. mile area	Uranium		Soil, Surface, Ground water	The potential contaminant release mechanism includes leaching of low-level radioactive contaminants through soils to ground water; while the DU rounds represent a radioactive hazard, uranium has not been detected in the ground water	Soil sampling and continued surface and ground water sampling
Forest Fires	NA	Forest fires have occured occasionally due to explosions of test shells	Particulates	Air	Soil	These are now usually controlled burns conducted by the JPG Fire Department	Continue controlled burns to minimize the chance of an unwanted, uncontrolled burn

AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY TABLE

Gate 19 Area

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Burning Ground	JPG-014	Used for the open burning of construction debris and waste POL, and solvents; area overgrown with vegetation; aerial photographs show liquid filled trenches and mounded material during its use from the 1950's to the 1970's; reportedly the disposal site of TCE and paint	TCE and lead	Air	Soil Ground water	Though this area is no longer used for burning of any type of material, the reports of TCE and paint dumping indicate that a release to the environment may have occurred in this area; wells installed at this location have not detected contamination	Locate area, sample soils, continue to sample ground water
Landfill	JPG-015	Used for disposal of construction debris and asbestos; comprised of 12 acres; reportedly the site of TCE and lead paint disposal	TCE and lead	Ground water	Soil	Hydrogeological analysis indicates that elevated levels of acetone are present; no lead or TCE were detected; no ground water contaminant plume has been detected thus far	Continue to sample existing wells; evaluate need for additional wells

AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY TABLE

Other Environmental Concerns

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
PCB-containing Oils	NA	252 transformers are located at JPG; analysis indicated that 7 of the transformers contained PCBs >500 ppm; upcoming change of the electrical distribution system will require the replacement of all electrical devices, including transformers, capacitors and breakers that contain PCBs	Polychlorinated Biphenyls			The inventory of tranformers did not indicate if a release of PCB liquids had occurred; potential PCB-contaminant release mechanisms include leaks from transformers onto soils and pavement	Remove and properly dispose of PCB transformers; wipe samples of floor stains in the transformer storage area
Asbestos	NA	Asbestos containing materials are present in various construction materials of several buildings; a preliminary survey estimated approximately 197,000 linear feet; asbestos shingles/siding contribute an additional 258,000 square feet; an on-going asbestos removal program is in place	Asbestos fibers	Air		The asbestos encountered were indicative of a significant amount of friable asbestos; a brief visual inspection noted that pipe lagging, and broken ceiling tiles were exposed to the natural elements of wind, heat, and water	Remove and dispose or encapsulate any asbestos material identified during an asbestos survey as presenting a threat to human health
Underground Storage Tanks	NA	There are 54 USTs located at various sites; the tanks were installed between 1941 & 1985; the tanks vary in size (300 and 25000 gallons) and construction (steel to coated steel) contents include No. 2 fuel and diesel oil, leaded and unleaded gasoline, kerosene and white gas	Volatile organics, lead, TPH		Soil Ground water	Recently promulgated UST regulations require the upgrade or removal/replacement of USTs to meet specific measures for leak detection, prevention, and remediation of releases; it is unknown whether the tanks are in compliance with the new regulations; the age of the tanks create the potential for leaks to surrounding soils; JPG currently has a UST management plan which provides for UST removal	Remove & dispose of the remaining USTs according to JPG's UST management program; perform required closure assessments; develop corrective actions plans as needed

AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY TABLE

Other Environmental Concerns; Continued

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Surface Water	NA	Several creeks traverse the proving ground; these include Otter Graham, Little Graham, Marble, Big, and Harberts Creeks	Explosives: TNT DNT, DU, Pesticides Metals		Surface water	Potential for contaminant release to surface waters on site is high; surface waters on site may carry contaminants from off-site to JPG	Conduct surface water and sediments sampling along major streams at JPG and at the installation boundary
Ground Water	NA	The bedrock in the JPG area does not have dependable water-bearing strata; public/private utilities provide water service to practically all households in the small rural areas surrounding JPG; nearly all of this water is pumped from the Madison well field which yields 8.3 MGD from the sand and alluvial aquifer of the Ohio River Valley; a number of private well users are in the surrounding area	Unknown		Ground water	Private wells could be considered as potential off-site receptors if contaminants are released via ground water flow from JPG; the regional flow appears to be in the south-south-west direction; however, geologic features alter the flow direction especially locally	Conduct ground water sampling around the perimeter of the installation, in addition to around SWMUs and AREEs as appropriate
Radon	NA	Radon gas is generated by the decay of uranium in the bedrock or other subsurface features; this gas can potentially exist in any of the buildings at JPG	Radon		Air		Conduct radon gas survey at each building
Lead Paint	NA	Several of the buildings at JPG were reportedly painted with lead paint	Lead				Conduct lead paint survey

LIST OF ACRONYMS AND ABBREVIATIONS (page 1 of 2)

AEHA	Army Environmental Hygiene Agency
Ag	silver
AMC	Army Materiel Command
ANL	Argonne National Laboratory
API	American Petroleum Institute
AREEs	areas requiring environmental evaluation
BNA	base/neutral/acid
BOD	biochemical oxygen demand
CARC	chemical agent resistant coating
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CS/CN	riot control agent
DNT	dinitrotoluene
DEM	Department of Environmental Management
DO	dissolved oxygen
DRMO	Defense Reutilization and Marketing Office
DU	depleted uranium
°F	degrees Farenheit
ft.	foot, feet
ft/min	feet/minute
HE	high explosive
HMX	1,3,5,7-tetranitro-1,3,5,7-tetraazacyclooctane
HVAC	heating, ventilation, and air conditioning
ICM	improved conventional munition
JPG	Jefferson Proving Ground
kg	kilograms
lbs.	pounds
MGD	million gallons per day
mg/l	milligrams/liter
MW	monitoring well
NaOH	sodium hydroxide
NODs	notification of any deficiencies
NPDES	National Pollutant Discharge Elimination System
PA	enhanced preliminary assessment
PCBs	polychlorinated biphenyls
PCP	pentachlorphenol
PEP	pyrotechnics, explosives, and propellants
POL	petroleum, oil, and lubricants
ppm	parts per million
PVC	polyvinylchloride
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
SARA	Superfund Amendments and Reauthorization Act
sq.	square
sq ft	square feet
STP	sewage treatment plant

SWMUs	solid waste management units

LIST OF ACRONYMS AND ABBREVIATIONS (page 2 of 2)

TECOM	U.S. Army Test and Evaluation Command
TCE	trichlorethylene
TNT	trinitrotoluene
TSCA	Toxic Substances Control Act
ug/g	micrograms/gram
ug/l	micrograms/liter
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USEPA	U.S. Environmental Protection Agency
USTs	underground storage tanks
UXO	unexploded ordnance
VOCs	volatile organic compounds

1.0 INTRODUCTION

This document is a report of the enhanced preliminary assessment (PA) conducted by Ebasco Environmental, through ANL at JPG which is located north of Madison, Indiana.

1.1 Authority for the Enhanced Preliminary Assessment

Ebasco has been retained by Argonne National Laboratory to support the Base Realignment and Closure Program by conducting an enhanced preliminary assessment of Jefferson Proving Ground. The report assesses environmental quality and areas requiring environmental evaluation before the property can be excessed.

Preliminary assessments are being conducted under the authority of the Department of Defense's Installation Restoration Program (IRP); the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 91-510, also known as Superfund; the Superfund Amendments and Reauthorization Act (SARA) of 1986, Public Law 99-499; and the Defense Authorization Amendments and Base Closure and Realignment Act of 1988, Public Law 100-526.

This PA was conducted in accordance with the procedures outlined in the EPA guidance document for Preliminary Assessments, Site Investigations, and Hazard Ranking System Scoring. As a result, this study was designed to investigate site management practices, waste characteristics and pollutant dispersal pathways. In addition, this PA is "enhanced" to include topics not normally addressed in a preliminary assessment report. As such, this assessment addresses the following topics and issues:

- Regulatory compliance status;
- Asbestos;
- Radon;
- Polychlorinated biphenyls (PCBs);
- Underground storage tanks (USTs);
- Lead based paint;
- Current or potential restraints on facility utilization;
- Environmental issues requiring resolution; and
- Other environmental concerns that might present impediments to the expeditious transfer and/or release of Jefferson Proving Ground.

1.2 Objectives

This PA report is based on existing information from JPG records,

including reports from U.S. Army Environmental Hygiene Agency (AEHA), U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), U.S. Environmental Protection Agency (USEPA) reports and permits, site visits, and personnel interviews. The scope of this PA does not include the generation of new data, but does identify areas where existing data are incomplete, ambiguous or unreliable, and recommends ways to improve such data. The objectives of the PA are to:

1) Identify and characterize the areas requiring environmental evaluation (AREEs);
2) Identify areas or AREEs that may require a site investigation;
3) Identify AREEs or areas of environmental contamination that may require immediate action;
4) Identify areas for which no further action is needed; and
5) Identify possible impacts to the areas from surrounding activities and land uses.

1.3 Procedures

The PA began with a review of JPG records reports and aerial photographs that were provided to Ebasco by USATHAMA and JPG. An initial site visit was conducted on October 20, 1989, by Ebasco Environmental, ANL, and USATHAMA personnel, in order to become familiar with the site location and personnel. A detailed site visit was conducted from November 13th through 17th, by Ebasco and USATHAMA personnel, in order to obtain additional information through direct observation and interviews with key JPG personnel. During a portion of the site visit (11/13 and 11/14), a representative of USEPA Region V was also present. During this site visit, the solid waste management units, buildings of concern and other areas requiring environmental evaluation (AREEs) were inspected. Photographs were taken of many of the AREEs and other areas of interest in order to document environmental conditions at JPG. Emphasis was placed on the identification and documentation of the AREEs, the definition of actual and potential pathways for migration of contamination, and the identification of any potential receptors of contamination.

1.4 Report Format

As indicated by the Table of Contents, this report provides an executive summary and evaluation of the data relevant to the preliminary assessment of JPG. In Section 2.0, the environment and land uses of JPG are described. Section 3.0 identifies and characterizes the areas requiring environmental evaluation (AREEs) at the site while Section 4.0 discusses both known and suspected

releases to the environment. Section 5.0 summarizes the findings of the PA, and discusses the conclusions drawn from the investigation as well as the quality and reliability of the information gathered. Section 6.0 identifies areas where further action is required and recommends procedures to accomplish such action. Section 7.0 lists all references, while the appendices contain the types of ammunition tested at JPG, JPG's Hazardous Waste Management Plan, photographs of JPG, recent sewage treatment plant analytical results, groundwater sampling results for the DU impact area, transformer and underground storage tank inventories, and JPG's Asbestos Management Program.

2.0 PROPERTY CHARACTERIZATION

The following subsections will discuss the property size, location, and other information pertinent to the description of Jefferson Proving Ground.

2.1 Mission

Jefferson Proving Ground is a sub-command of the U.S. Army Test and Evaluation Command (TECOM). TECOM is a sub-command of Army Materiel Command (AMC). The mission of JPG is to plan and conduct production acceptance tests, reconditioning tests, surveillance tests, and other studies of ammunition and weapons systems (including components of the systems).

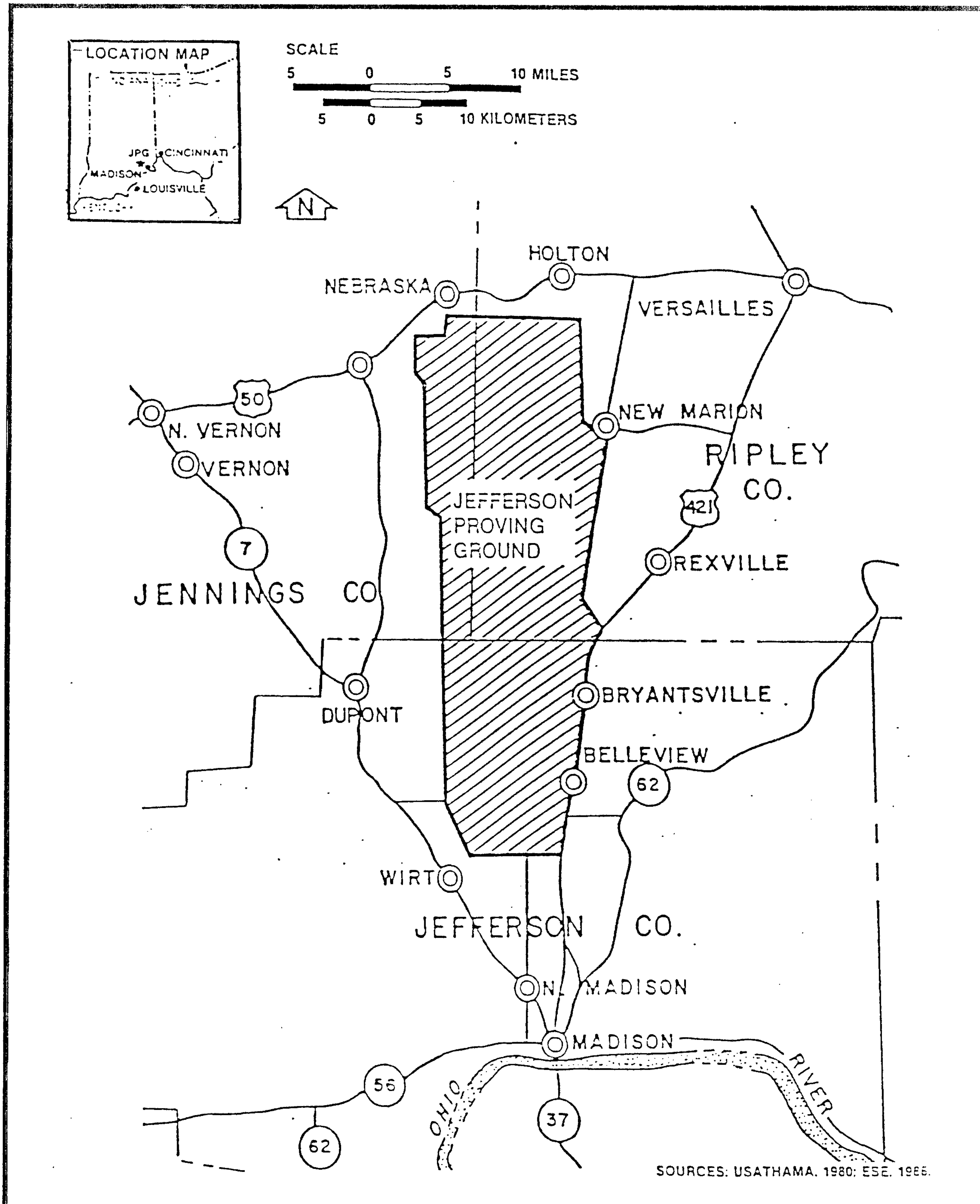
2.2 General Property Information

Jefferson Proving Ground occupies 55,265 acres of land along U.S. Highway 421, north of Madison, Indiana (Figure 1). JPG is a part of the U.S. Army Test and Evaluation Command (TECOM), Aberdeen Proving Ground, Maryland. The facility is located on U.S. Highway 421 approximately 9 miles north of Madison, Indiana and about 85 miles southeast of Indianapolis, Indiana. The installation is approximately 22 miles long (north-south) and five miles wide.

Portions of JPG are located in Ripley, Jennings, and Jefferson Counties. JPG has been used as a testing ground for ammunition since its purchase in 1940. A wide assortment of munitions and ordnance have been tested at JPG; these include propellants, mines, ammunition, cartridge cases, artillery projectiles, mortar rounds, grenades, tank ammunition, bombs, boosters and rockets.

2.3 Facility Description

JPG was designed and built as a test range for testing conventional ordnance. The main firing line is in the southern part of the facility, and runs east-west for five miles. Most of JPG is wooded, with clear areas surrounding the building complexes and airport south of the firing line. The non-wooded areas north of the firing line are mainly in the high impact target areas. The topography of JPG is flat to rolling, with most relief due to stream incision. Surface water drainage is northeast to southwest, and consists of six streams and their tributaries (Figure 2).



ENHANCED PRELIMINARY ASSESSMENT
JEFFERSON PROVING GROUND
MADISON, INDIANA

EBASCO ENVIRONMENTAL

FIGURE 1
Location Map

2.3.1 Materiel Proof and Surveillance

The buildings, roadways, and fixtures in this section have been built to meet the requirements of the primary mission of JPG. There are 268 gun positions, 50 impact fields, 13 permanent test complexes, and seven ammunition assembly plants.

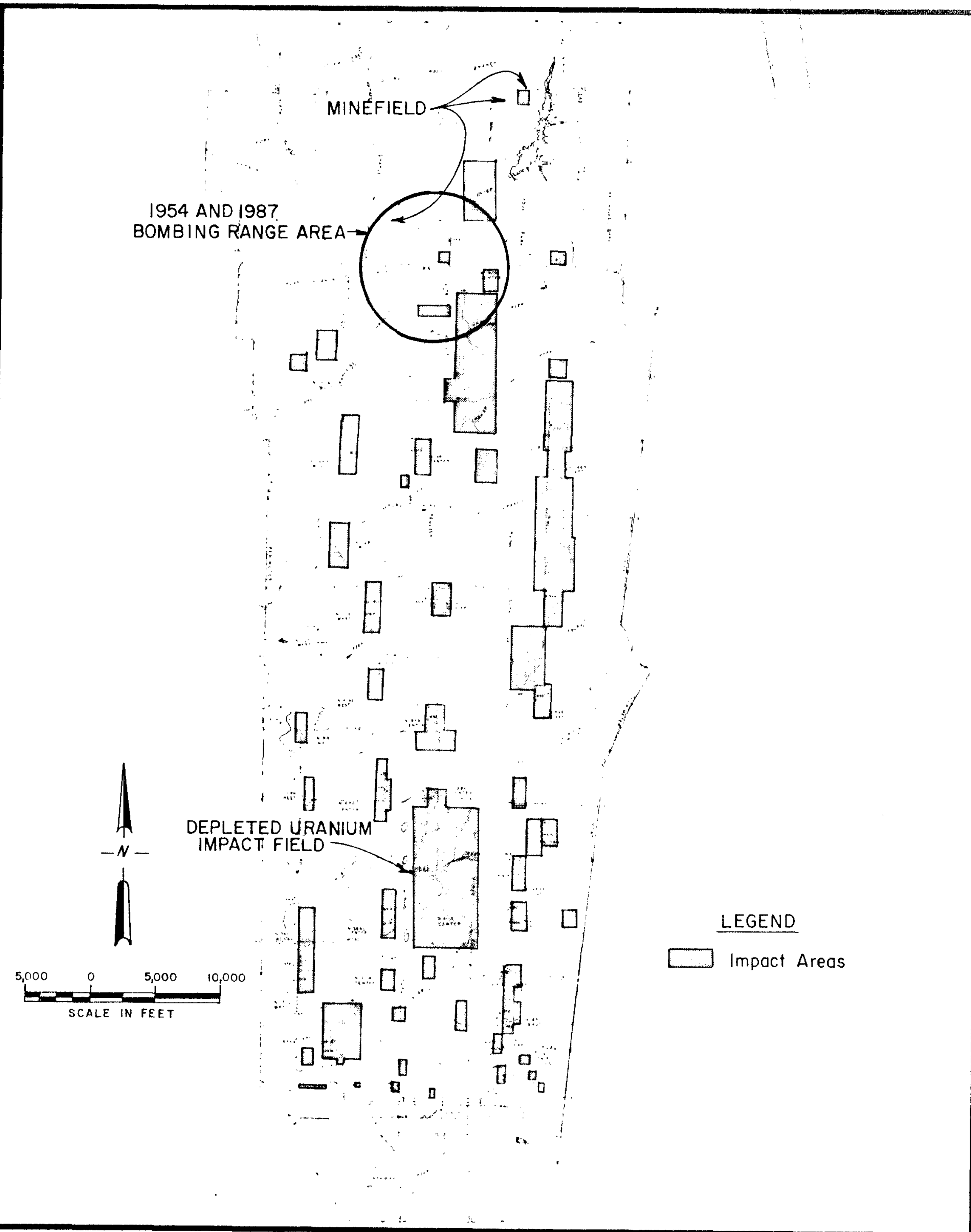
The ammunition assembly plants are used for the purposes of loading calibration rounds used as a baseline for performance of ammunition/weapons systems.

In order to support the testing mission, environmental test facilities are available. These include extreme temperature chambers, temperature/humidity chambers, a jolt and tumble test facility, and a transportation vibration system. A twelve meter drop test facility is available on the North Range.

The gun positions include reinforced concrete bunkers to ensure firing team safety during the test shots. The firing positions are equipped with remote firing controls.

The impact areas on JPG, shown on Figure 3, include high impact targets, macadam and sediment bottom ponds for testing proximity fuses, a gunnery range at the northern portion of the site, mine fields, and a depleted uranium impact area. Also associated with the impact areas are safety fans (areas where long or short rounds may fall) as well as observation bunkers, which are used to house personnel who measure range and height of bursts. All of the impact areas are considered to be contaminated with unexploded ordnance (UXO).

An important fact for consideration about the area north of the firing line is that most of the areas between the actual target shave been contaminated with UXO. The reason for this is that the actual target areas are used only when the detonation and/or impact of the projectile is important to the test. Many of the tests are used only for velocity measurements, gun tube proofing, propellant tests, etc., and impact points are unimportant. Thus, the targets are not ranged. This means that UXO is not limited to the designated firing ranges and may be found anywhere north of the firing line. Appendix 1 contains a representative list of the types of ammunition tested at JPG. Several areas south of the firing line have been used for the testing of munitions and may also be contaminated with UXO.



ENHANCED PRELIMINARY ASSESSMENT
JEFFERSON PROVING GROUND
MADISON, INDIANA

EBASCO ENVIRONMENTAL

FIGURE 3
Location of Impact Field

2.3.2 Maintenance

There are several locations at JPG that can be classified as maintenance areas. These are transportation maintenance, weapons maintenance, and the paint shop. Building 186 is the motor pool and vehicle maintenance building. Work conducted at this building includes both minor vehicular work such as tuning automobile and truck engines and major overhauls/refitting of earth moving equipment and tanks.

Building 227 is the weapons maintenance building. Operations here include mounting of weapons components (e.g. gun tubes, breeches, etc.) for test firing, and dismounting these components for measurement and analysis (e.g. crack/fatigue testing). The main mission associated with Building 227 is production acceptance testing.

The paint shop, Building 136, contains two paint booths which are used for general painting (e.g. street signs). Chemical Agent Resistant Coating (CARC) painting of weapons components/weapons systems is conducted outside Building 227 and inside Building 223. During the site visit, it was observed that the spray booths were being refitted with a dry filter for capturing overspray thus eliminating the use of a water overspray collection system. In order to prepare metal items for painting, sand blasting of these items also occurs here.

2.3.3 Utilities

The utilities available on site include electrical service, potable water, sanitary sewage, and, for some buildings, boiler (heating) plants. The electrical service includes primary and secondary distribution networks. Electricity is not produced on JPG but is available commercially from Public Service Indiana.

Potable water at JPG is available from the City of Madison. Madison's wells are located near the Ohio River, and have been completed in the unconsolidated alluvium known as the Ohio River Basin Aquifer. The water is treated to meet primary drinking water standards.

The water supply wells that previously serviced JPG are located west of Madison, Indiana, adjacent to the Ohio River (Figure 2). The wells are located above the record high water elevation of the river. There are two 12-inch diameter wells, each completed to a depth of 135 feet. The wells have a combined capacity of 1,274 gallons per minute. Water was pumped from the wells into a 35,000 gallon reservoir. The water was pumped from the reservoir through 31,527 feet of 8-inch steel and cast iron pipe.

Boiler plants have been used for heating of ammunition assembly plants. These heating plants are remote from the ammunition plants (Building 602, for example) for safety reasons . A central heating plant (Building 103) provides steam heat for many of the facility buildings.

2.3.4 Laboratory

Two laboratories operate at JPG; a water quality laboratory and a photographic laboratory. The water quality lab has operated since the 1960s. Analyses performed include pH, flow, biochemical oxygen demand (BOD), total suspended solids, fecal coliform and residual chlorine. Wastes from the water quality laboratory are discharged to the sanitary sewer system.

The photographic laboratory (Building 208) is used to develop motion picture, black and white, X-ray, and color film. It is also used to produce prints from photographic negatives. Since 1967, silver has been recovered from the photo processing solutions. Wastes from the photo lab processes are discharged to the sanitary sewer system.

2.3.5 Training Areas

There have been several training areas at JPG. These include the air-to-ground gunnery range in the northern portion of the installation, a fire training pit at the airport, and a chemical impregnation plant (used by the U.S. Army Reserve) at the airport hangar. It is also reported that the U.S. Army Corps of Engineers operated four training areas in the northern portion of JPG. It is not known what type of training occurred in these areas.

The gunnery range was constructed in 1976 for use of the 181st Tactical Fighter Group of the Indiana National Guard. The U.S. Air Force is also currently using the gunnery range. Only dummy rounds are used in these operations. The area is also used for bombing practice.

The fire training pit was used in fire training drills. During training, the pit would be filled with water, and thirty to fifty gallons of fuel oil would be floated on the water and set aflame. The fire crew would then practice by extinguishing the flames. The fire training pit is no longer used. A new fire training pit with a concrete lining was constructed, and has been in use since the fall of 1989.

The chemical impregnation plant used by the Army Reserve to wash web belts, field packs, etc., is no longer in evidence at the JPG

airport hangar. The chemical constituents used, nor how the chemicals were stored and handled, are not known. It is reported that one or two JPG employees were a part of the reserve unit which utilized the chemical impregnation plant. An attempt has been made to contact these individuals, and the reserve unit, in order to determine dates of use as well as chemicals used.

2.4 Property History

The development of JPG is related to World War II and the Korean War. In 1940, the Chief of Ordnance, Army Service Forces determined the need for a large proving ground to simultaneously conduct research and development tests and production acceptance tests. Existing proving grounds were found to be inadequate to support the World War II effort. Accordingly, 55,264 acres were purchased, and construction began in December, 1940. The first round of ammunition was tested on May 10, 1941. The proving ground was in active use by the end of 1941, and by 1945, 149 of its present 332 buildings were constructed.

Testing activities were sharply reduced at the end of World War II. Consequently, JPG became a subpost of Indiana Arsenal instead of an independent command on March 30, 1946. The outbreak of the Korean War reactivated JPG on June 24, 1950. Between 1951 and 1955, 107 new structures were constructed. These included additional test firing and storage facilities. During the period from 1951 through 1955, JPG focused on special production engineering tests as well as research and development tests.

Testing activities again decreased after the Korean War. JPG was subsequently placed on standby status with ammunition test capabilities held at a high level of readiness on July 1, 1958.

JPG was reactivated on September 8, 1961 and has been in continuous operation as a test range since that time. Since August 1, 1962, JPG has been a part of TECOM. The current mission of the facility includes the planning and conducting of the following types of tests:

- o Production acceptance;
- o Pre-production;
- o Product improvement;
- o Engineering design;
- o Reconditioning; and
- o Surveillance of ammunition and components.

In 1989, JPG was one of many installations identified for base closure. Under the guidelines for the base closure plan, testing activities are expected to stop by 1994 and land disposition accomplished by 1995. The enhanced PA is designed to assess the

potential impacts the installation has on the environment. The following sections address these and other concerns affecting the disposition of JPG.

2.5 Tenant Activities

There are no tenants at JPG.

2.6 Historic Buildings/Archaeology

The United States Army Materiel Command (AMC) initiated two studies to bring Army installations into compliance with the National Historic Preservation Act of 1966, its amendments, and related Federal laws and regulations. The first one, completed in July 1984, focused on survey of historic properties (districts, buildings, structures, and objects). The second one, completed in January 1985, reviewed existing information to identify the extent of archeological resources at JPG and develop an appropriate cultural resources management program.

The historic Properties Report (July, 1984) describes the methodology employed in the study. To be considered of historic significance, properties must satisfy one or more of the following criteria:

- Properties should be associated with events that have made a significant contribution to historic value;
- Properties should be associated with the lives of persons significant in the nation's past;
- Properties should be characteristic of a type, period or method of construction, represent the work of a master, possess high artistic values or represent a significant and distinguishable entity; or
- Properties should have yielded or have the potential to yield important historical or prehistorical information.

Based on the above criteria, eligible properties at JPG were further categorized into one of the following five Army historic property categories:

- Category I: Properties of major importance;
- Category II: Properties of importance;
- Category III: Properties of minor importance;
- Category IV: Properties of little or no importance; and
- Category V: Properties detrimental to the significance of adjacent historic properties.

The assessment centered on an extensive review of the military construction of the 1940-1945 period, its contribution to World War II history, and the post-war Army landscape. The Historic Properties Report concluded that there are no Category I or II historic properties at JPG. The Old Timbers Lodge (Building 485) constructed during 1930-1932 is a Category III historic property because of its importance as a local landmark and as a work of architecture. The Oakdale School (Building 401), built in the late 1860s and one of the last remaining one-room schools in the local area, is a Category III historic property. Four stone arch bridges located uprange, all of nineteenth century design, are also Category III historic properties.

Woodward-Clyde Consultants conducted the study on archeological resources at JPG. The methodology used and the findings of the study are presented in their final report entitled "An Archeological Overview and Management Plan for the Jefferson Proving Ground, Jefferson, Jennings, and Ripley Counties, Indiana" (Report No. 24, January 7, 1988).

According to this report, one reconnaissance level survey investigated 150 acres of the facility. One prehistoric site, consisting of a single, fragmentary projectile point, was located. In addition, 478 potential historic sites have been identified. The report recommends that other areas should also be surveyed to cover those areas of JPG not previously investigated. Gaps in data adequacy were identified, and an appropriate archeological resource management plan was presented with cost estimates to implement the plan.

2.7 Permitting Status

JPG activities require the following major permits:

- o RCRA Permit;
- o NPDES Permit;
- o Fire Training Permit;
- o Open Burning Permit; and
- o Air Permit.

An air permit would normally be required to operate an incinerator. In the case of JPG, local regulations require an air permit only if at least 10 tons/day of solid wastes are incinerated. JPG's new incinerator capacity is only 4 tons/day. Consequently, no air permits are required to operate the incinerator.

A brief discussion of the purpose and status of other permits follows.

RCRA Interim Permit: JPG requires a RCRA Interim Permit because pyrotechnics, explosives, and propellants (PEP) are stored and thermally treated at the facility. PEP items are also detonated on open ground. JPG submitted a RCRA Interim Permit application in November, 1988. The application is being reviewed by U.S. EPA, Region V. The facility has yet to receive notification of any deficiencies (NODs) in the application. Based on processing time for similar applications at other facilities, a RCRA Permit for JPG could be expected by 1991.

NPDES Permit: JPG requires an NPDES Permit to discharge the effluent from its sewage treatment plant (STP). The permit, which is valid for five years, expired in July, 1989. JPG applied for a renewal in June, 1989. The State of Indiana is currently reviewing the application. JPG expects to receive a renewed permit by April 1990.

Fire Training Permit: JPG requires a local Fire Training Permit to train personnel in fire fighting. Fires are set using fuel oil No. 2, and fire fighting exercises conducted under the supervision of State and local fire fighting agencies. The permit is renewed annually. The current permit was issued on January 4, 1990.

Open Burning Permit: JPG requires this permit from the Indiana Department of Environmental Management to burn excess propellants and explosives, vegetation (to selectively clear the grounds for testing), and scrap wood. This permit is renewed annually. JPG's current permit was issued on January 4, 1990. The facility's Part B application (currently under review) includes open burning of excess propellants and explosives. Once the application is approved and the permit is issued, the facility will not require an annual permit from the State of Indiana, except for burning of vegetation and scrap wood.

Air Permits: The major sources of air emissions at JPG are: (a) emissions from the central energy plant; (b) emissions from the incinerator; (c) emissions from ammunition testing; and (d) emissions from open burning. The central energy plant is equipped with smoke detection devices. Emissions from incinerator operations are considered "deminimus" according to local regulations. Industrial activity in the vicinity of the installation is limited.

Open burning of excess propellants and explosives also produces air emissions. JPG has a permit from the Indiana Department of Environmental Management to conduct such burning. Therefore, no additional air permits are required for JPG.

According to Air Pollution Guidelines (February 6, 1978), Jefferson and Ripley Counties are in Basin Priority "C," while part of Jennings County is in Basin Priority "B." During an inversion or air pollution alert, JPG has the capability to stop all processes

which produce emissions. To date, there are no indications that mission activities at JPG have adversely impacted air quality in the surrounding areas.

2.8 Surrounding Environment and Land Uses

This section presents a brief summary of surrounding environment and land use. All of the information is derived from existing documents such as from the Indiana Department of Environmental Management, U.S. Army Jefferson Proving Ground Evaluation, Madison, Indiana, Report to the Governor, April 20, 1989 and the Environmental Impact Assessment of U.S. Army Jefferson Proving Ground, Department of the Army, U.S. Army Test and Evaluation Command, Jefferson Proving Ground, April 1978 Revision.

2.8.1 Demographics and Land Use

In April, 1953, about 1,774 employees worked at JPG. JPG currently employs 386 people, of which 3 are military and 383 are civilian personnel. Numerous rural towns such as New Marion, Holton, Nebraska, Rexville, Grantsburg, Belleview, Middlefork, San Jacinto, and Wirt are in close proximity to the JPG facility.

By the year 2000, the Division of Planning, Department of Commerce of the State of Indiana projects a population of 37,000 for Jefferson County, 17,000 for the City of Madison, 25,000 for Ripley County, and 27,000 for Jennings County. These projections indicate the rural nature of the areas surrounding JPG.

The area in the immediate vicinity of the installation is farm land. The land use prior to the development of this installation was also primarily agricultural. Sorghum, tobacco, corn, and wheat were the major crops grown.

2.8.2 Climate

The climate at JPG is mid-continental with frequent changes in temperature and humidity. During the summer, the temperature averages from 77-88°F. On an average, the temperature exceeds 90°F for 39 days a year. In winter the average temperature ranges from 22-35°F. Winter precipitation increases soil moisture by spring and minimizes drought effects during summer. The total annual precipitation is about 42-44 inches. Nearly 50 percent of the precipitation occurs during the growing season. On the average, 28 days of the year have precipitation greater than or equal to 0.5 inch.

JPG is located in an area subject to tornadoes and severe thunderstorms. To date, no direct damage has occurred at the facility, but tornadoes did strike nearby communities in April, 1974, causing nine deaths and many injuries in the communities of Madison and Hanover.

2.8.3 Surface Water

In general, the topography at JPG and its immediate surroundings is that of smooth uplands sloping toward the west. Several creeks traverse the proving ground. These include Otter Creek, Graham Creek, Little Graham Creek, Marble Creek, Big Creek, and Harberts Creek. The closest river to the facility is the Ohio River. The surrounding area is not frequently flooded.

2.8.4 Ground Water and Hydrogeology

The bedrock in the JPG area does not have dependable water-bearing strata. Public and private utilities provide water service to practically all households in the rural area surrounding JPG. Nearly all of this water is pumped from the City of Madison well field, which yields approximately 8.3 MGD from the sand and gravel alluvial aquifer of the Ohio River Valley. There are limited numbers of private wells in the surrounding area. These private wells could be considered as potential off-site receptors if contaminants are released via ground water flow from JPG. The regional ground water flow appears to be in the south-southwest direction. However, many bedrock features such as interconnecting joints, fractures, and solution channels and other man-made influences could alter the flow direction.

2.8.5 Sensitive Environments

The sensitive environments surrounding JPG include habitat for endangered and rare species. There are no wetlands in the immediate vicinity. Ten rare species of mammals are believed to be residing near the JPG facility. The Indiana Brown Bat is endangered worldwide, and occurs mainly in southern Indiana. In addition, five species of birds considered either rare or endangered nationally are migrant, occasional visitors, or are found in limited areas of Indiana.

Federally protected endangered species that have been identified as living on Jefferson Proving Ground include:

<u>Mammals</u>:

Canis lupus lycaon - Eastern Timber Wolf;
Canis rufus - Red Wolf;
Felis concolor cougar - Eastern Cougar; and
Hyotis sodalis - Indiana Bat.

<u>Birds</u>:

Campephilus principalis - Ivory-billed Woodpecker;
Dendroica kirtland II - Kirtland's Warbler;
Falco peregrinus anatum - American Peregrine Falcon;
Falco peregrinus tundruis - Arctic Peregrine Falcon;
Pelecanus occidentalis - Brown Pelican; and
Vermivora bachman II - Bachman's Warbler.

<u>Fishes</u>:

Coregonus alpenae - Longjaw Cisco

When and if discovered at JPG, these Federally protected endangered species will b protected. The activities at the facility do not appear to have adversely impacted any of the sensitive environments surrounding JPG.

2.8.6 Forest and Wildlife Management

Although JPG is primarily a proving ground for testing military weapons and ammunition, the facility also has an active forest and wildlife management program. Prior to land acquisition in 1940, the woodlands were owned by private individuals who had no technical or professional guidance. Natural resource management was dictated more by need for income than by cultural needs. Past timber harvests removed the biggest and the best trees, leaving smaller and lower quality trees through the practice of high grading. Early timber management on JPG under the U.S. Army was a continuation of the past tradition.

In 1978, the U.S. Army conducted a basic inventory, but faulty forest management practices resulted in high-grading of the entire north end of the facility. In 1982, the Corps of Engineers, Louisville District took over forest management responsibilities and introduced an intensive forest management program.
A detailed inventory was conducted for the north end of the installation in 1986. This inventory identified more than twenty-five (25) different types of timber, and forty-six (46) different species of trees of which forty (40) are potentially merchantable.

The primary forest products are pine wood, hardwood, and miscellaneous forest products. Currently, no reliable commercial market exists for pine wood and associated products in southern Indiana (National Resource Management Plan, U.S. Army Corps of Engineers, Louisville District, 1986-1996). Hardwood is the most economically valuable timber. The most desirable species are white oak, red oak, black oak, and black walnut, all of which are found at JPG in significant quantities. JPG's forest management program is designed to produce high quality hardwood, saw timber, and veneer on a sustained yield, multiple-use basis with possible sale of miscellaneous forest products such as firewood and fence posts. The sale of miscellaneous forest products is not expected to generate substantial revenues, but will provide a tool for improving timber stand. The forest management program also includes management of aspen, hickory, and cull trees for wildlife.

The presence of unexploded ordnance (UXO) makes timber harvesting potentially hazardous. Metal contamination of a timber stand is possible throughout the northern end of the installation. This metal contamination is due to shrapnel from ordnance, not heavy metals that may be found in soils.

An active wildlife management program is also in place to control the population of various wildlife species (e.g., deer). Animals are selectively tagged and examined to study the impact of testing depleted uranium penetrators (DU) on wildlife. The wildlife at JPG have adapted well to the constant exposure to the firing of munitions. White tailed deer population persists at a density two to three times higher than that found in surrounding counties. Restricted deer hunts have been administered since the 1960's. An active wildlife management program should be continued to prevent illegal poaching activities and preserve wildlife habitat.

2.9 Environmental Studies at JPG

Several reports regarding various environmental aspects of JPG have been written over the years. These reports serve to provide baseline information from which to assess potential environmental impacts. The previous reports described environmentally significant conditions, many of which were subsequently or are now under further investigation or being remediated. These studies serve as a historical background of environmental concerns at JPG, and should be viewed from that perspective. All supporting documents for the PA are listed in Section 7.0, and include the reports and studies listed below, as well as others which were reviewed and found to contain information pertinent to the development of the PA. Much of the environmental setting description of Section 2.0 was obtained from past JPG investigations, although additional regional information was incorporated as well. Section 3.0 describes Areas Requiring

Environmental Evaluation (AREEs), and references these studies where appropriate. The reports and studies described below have been subdivided into categories according to their content.

2.9.1 General Environmental Assessments

Several investigations of the environmental setting at JPG have been conducted over the past years. Many of these investigations provided pertinent information on specific environmental aspects of JPG. Four reports provided an overall summary of the environmental setting at JPG in addition to regional data. These four reports, listed below, were conducted on an installation-wide basis.

- O'Neill, John E. April 1978 Revision. Environmental Impact Assessment of Jefferson Proving Ground, Department of the Army, U.S. Army Test and Evaluation Command, Jefferson Proving Ground, Indiana.

- USATHAMA. August 1980. Installation Assessment of Jefferson Proving Ground, Report No. 176, , Aberdeen Proving Ground, Maryland.

- Bonds, J.D., K.J. Tribbey, K.A. Civitarese. February 1988. Update of the Initial Installation Assessment of Jefferson Proving Ground AMXTH-IR-A-176(u), Final Report, Environmental Science and Engineering for USATHAMA, Aberdeen Proving Ground, Maryland.

- Indiana Department of Environmental Management, April 20, 1989. Report to the Governor, U.S. Army Jefferson Proving Ground Evaluation, Madison, Indiana.

Additionally, a historical survey of activities at JPG provided background information which was useful in the development of the PA (History of Jefferson Proving Ground, Jefferson Proving Ground, Madison, Indiana. Provided by Mike Moore, Operations Research Analyst, Management Control Division, Jefferson Proving Ground). In terms of specific environmental practices at JPG, two documents provided valuable information:

- Herring, Richard. 1988. Application for Source Material License Renewal--Soft Impact of DU Munitions, U.S. Army Jefferson Proving Ground, Madison, Indiana.

- Prepared for U.S. Army Corps of Engineers by Engineering, Design and Geosciences Group, Inc., November 1988. RCRA Part B Application for Open Burning/Open Detonation. Knoxville, Tennessee.

2.9.2 Hydrogeology/Water Quality and Remedial Investigations

Several investigations have been conducted pertaining to the hydrogeologic characteristics and water quality of JPG. No detailed installation-wide groundwater quality investigation has been conducted at JPG. In addition to water quality assessments, a remedial investigation was conducted in 1987 to characterize several areas of environmental concern at JPG. The aforementioned investigations, with their related documents listed below, provided specific data which was pertinent to the development of the PA.

- U.S. Army Environmental Hygiene Agency. 1973. Water Quality Monitoring Consultation No. 24-001-74; Jefferson Proving Ground, Madison, Indiana.
- U.S. Army Environmental Hygiene Agency, 22-23 October 1974. Water Quality Engineering Special Study No. 99-026-73/75, Jefferson Proving Ground, Madison, Indiana.
- U.S. Army Environmental Hygiene Agency, 7-11 January 1980. Water Quality Engineering Survey No. 31-61-0153-80, Jefferson Proving Ground, Madison, Indiana.
- U.S. Army Environmental Hygiene Agency, 8-12 August 1988. Interim Final Report,Ground Water Contamination Survey No. 38-26-0306-89, Evaluation of Solid Waste Management Units, Jefferson Proving Ground, Madison, Indiana.
- U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). 1989. Remedial Investigation at Jefferson Proving Ground, Technical Report A011. Aberdeen Proving Ground, Maryland.

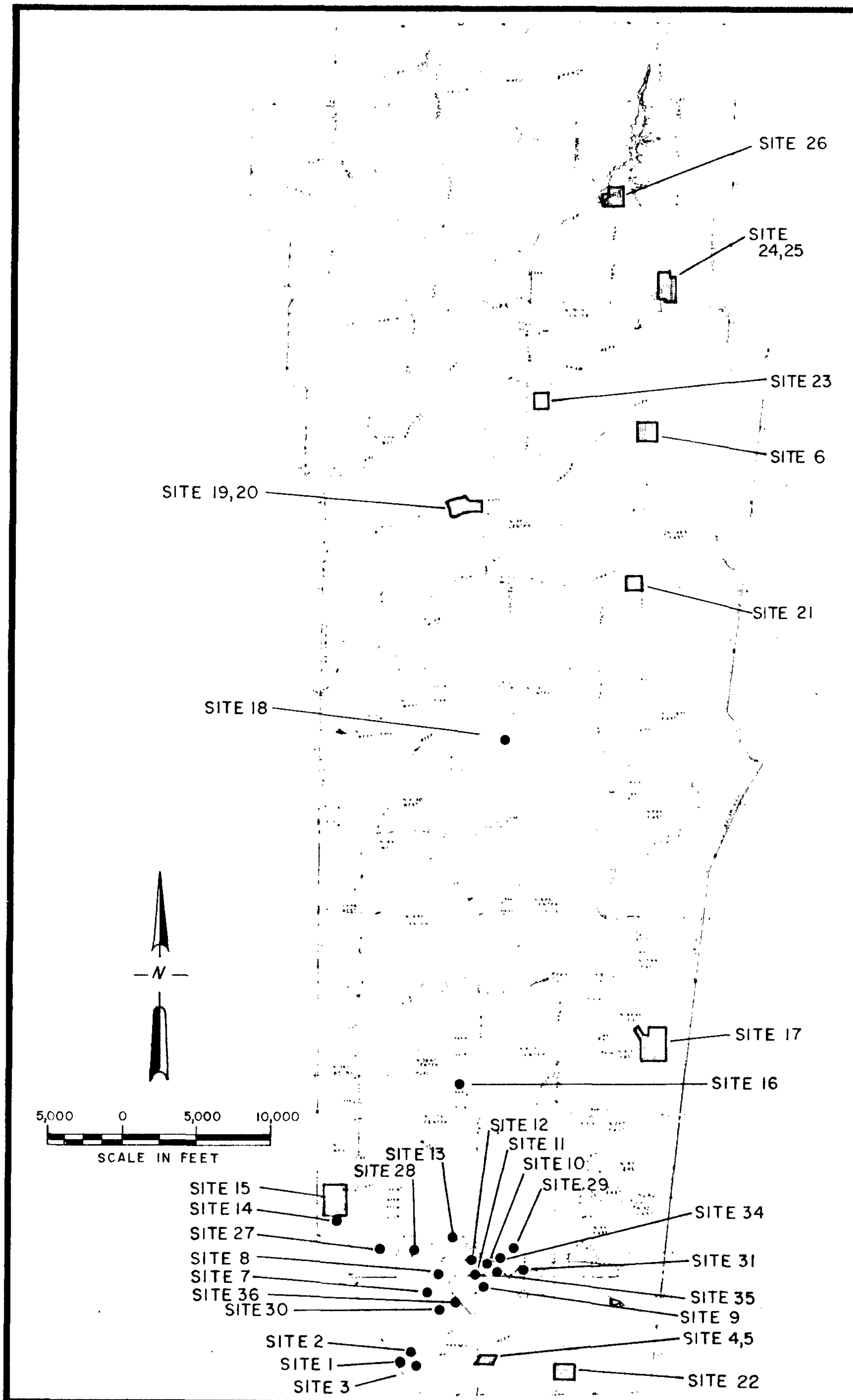
3.0 AREAS REQUIRING ENVIRONMENTAL EVALUATION

Several studies and surveys have been performed to evaluate the areas requiring environmental evaluation at JPG. The USATHAMA Installation Assessment of JPG, August 1980, and subsequent update, January 1988, provided an extensive review of records and past operations in an effort to assess the environmental quality. This document discusses the use, storage, treatment, and disposal of toxic and hazardous materials and defined conditions which may adversely affect public health and welfare or result in environmental degradation. In addition, the Ground water Contamination Survey - Evaluation of Solid Waste Management Units, August 1988, provided a comprehensive assessment of the thirty-six SWMUs. The purpose of the survey was to generate information which would aid JPG in the identification of those SWMUs requiring environmental sampling or corrective action to assist in bringing the units into compliance with Federal Regulations.

The Ebasco site visit at JPG, conducted in November 1989, was performed to identify and evaluate the areas requiring environmental evaluation, confirm the findings of the previous studies, and to identify areas of environmental concern. The performance of the site visit, and subsequent records search and review, identified forty-two areas requiring environmental evaluation (AREEs) on JPG. Thirty-six Solid Waste Management Units (SWMUs) are located on JPG (Figure 4). In addition, ten areas of environmental concern have been identified and will be considered, along with the SWMUs, as areas requiring environmental evaluation. JPG currently utilizes a hazardous waste management plan (Appendix 2) for the operation of areas requiring environmental evaluation. The following sections, based on information compiled from previous documentation concerning these operations at JPG, will describe these operations and include findings and discussion concerning:

- Location;
- Type;
- Size;
- Waste Characteristics;
- Migration Pathways; and
- Evidence of Release.

The following subsections will discuss the findings of the record search and review, as well as the site visit. The SWMU numerical designations from previous studies have been retained to avoid confusion. The SWMUs have been grouped according to general location as follows: 1) South of the Firing Line (West Side); 2) South of the Firing Line (East Side); 3) Firing Line Area; 4) North of the Firing Line; 4) Gate 19 Area; and 5) Other Areas of Environmental Concern. Photographs of some of these areas, taken during the site visit, are located in Appendix 3.



Key

1 Incinerator
2 Water Quality Laboratory
3 Sewage Treatment Plant
4 Explosive Burning Area
5 Landfill
6 Explosive Burning Ground
7 Storage of Wooden Ammunition Boxes
8 Burning Area
9 Red Lead Disposal Area
10 Photographic Laboratory
11 Incinerator
12 Indoor Range
13 Area Used for Ammunition Demilitarization
14 Burning Ground
15 Landfill
16 Ordnance Disposal Site
17 Landfill
18 Abandoned Well Disposal Site
19 Munition Test Pond
20 Macadam Test Pond
21 Abandoned Well Disposal Site
22 Burning Area for Explosive Residue
23 Demolition Ground
24 Landfill
25 Landfill
26 Landfill
27 Bldg. 602-Solvent Pit
28 Bldg. 617-Solvent Pit
29 Bldg. 279-Solvent Pit
30 Old Fire Training Pit
31 Bldg. 105-Temporary Storage
34 Bldg. 227-Temporary Storage
35 Bldg. 186-Temporary Storage
36 Bldg. 305-Temporary Storage

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FIGURE 4

Locations of 36 SWMUs

3.1 South of the Firing Line (West Side)

There are ten (10) designated SWMUs and three (3) areas of concern (identified during the site visit) located south of the firing line on the west side (Figure 5).

3.1.1 Building 185 (Old Incinerator) - JPG-001

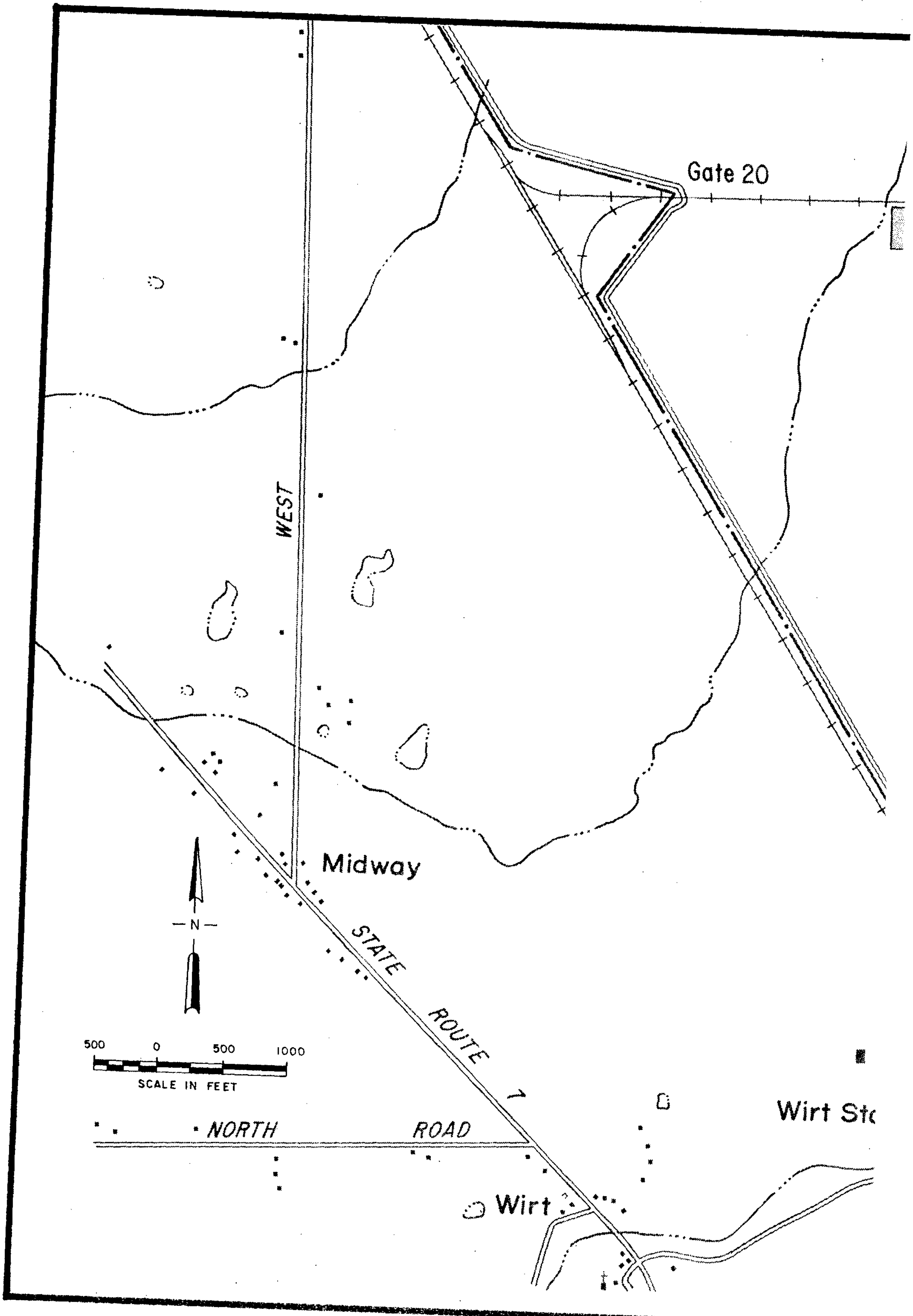
JPG-001 is a 556 square foot, Morse-Boulger, single chamber, six-burner, single stack incinerator without an afterburner unit (Figure 5). The incinerator was built into a brick wall as a permanent feature of Building 185. The incinerator was used to burn paper products from the installation, debris, and small ammunition. Approximate dates of use were from 1941 to 1978. The incinerator is currently closed and Building 185 is used for the storage of fertilizer and tools.

Particulate matter produced by incineration of paper products was reportedly vented to the atmosphere during operations. The applicable contaminant release mechanism is air transportation of particulates, but because this unit is not active, there is currently no environmental migration pathway or exposure potential. No evidence of release was observed during the site visit.

3.1.2 Water Quality Laboratory - JPG-002

JPG-002 is a 832 square foot water quality laboratory (Figure 5). The laboratory has been operational at the sewage treatment plant since the 1960's. Prior to 1971, analyses performed at the laboratory were settleable solids of the raw influent to the sewage treatment plant, effluent from the primary settling tank, and effluent from the final clarifier; and pH of the plant influent and effluent from the primary settling tank. Since the mid-1970s, analyses performed have included flow, pH, biochemical oxygen demand, total suspended solids, fecal coliform, and residual chlorine. In addition, two (2) randomly-collected samples of potable water are checked for coliform bacteria by the water quality laboratory each week.

The specific wastes generated at the water quality laboratory include a small amount of spent chemicals used for laboratory analysis. The contaminant release mechanisms for this waste type include releases from improper disposal practices. JPG has recently completed an installation-wide sewer system maintenance, upgrade, and replacement program to ensure that inflow-infiltration of rain water does not occur. In addition, standard operating



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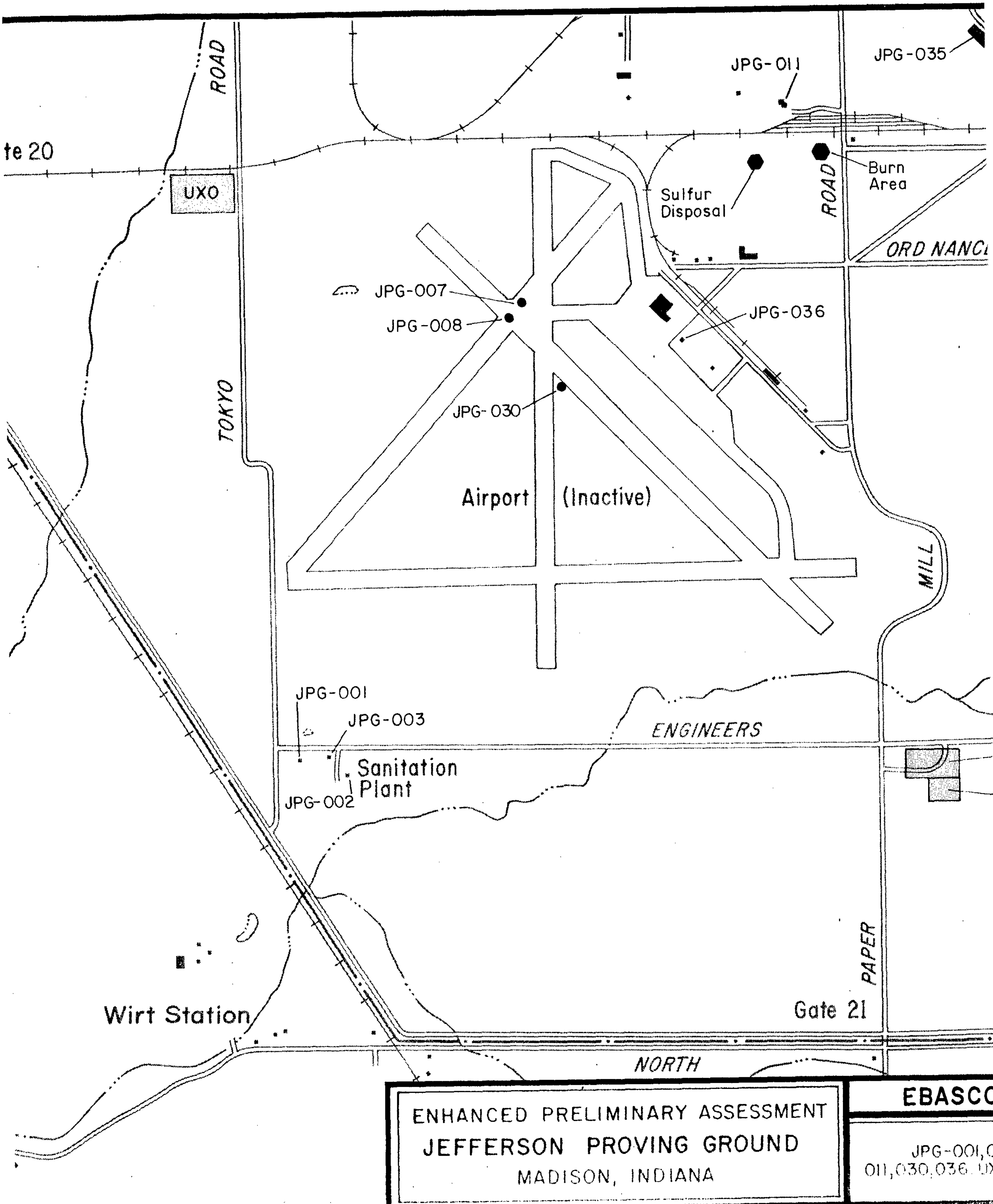

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ROAD
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JPG-011
JPG-035
Sulfur
Disposal
ROAD
Burn
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JPG-007
JPG-008
JPG-036
TOKYO
JPG-030
Airport
(Inactive)
MILL
JPG-001
JPG-003
ENGINEERS
Sanitation
Plant
JPG-002
PAPER
Wirt Station
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011,030,036 UX

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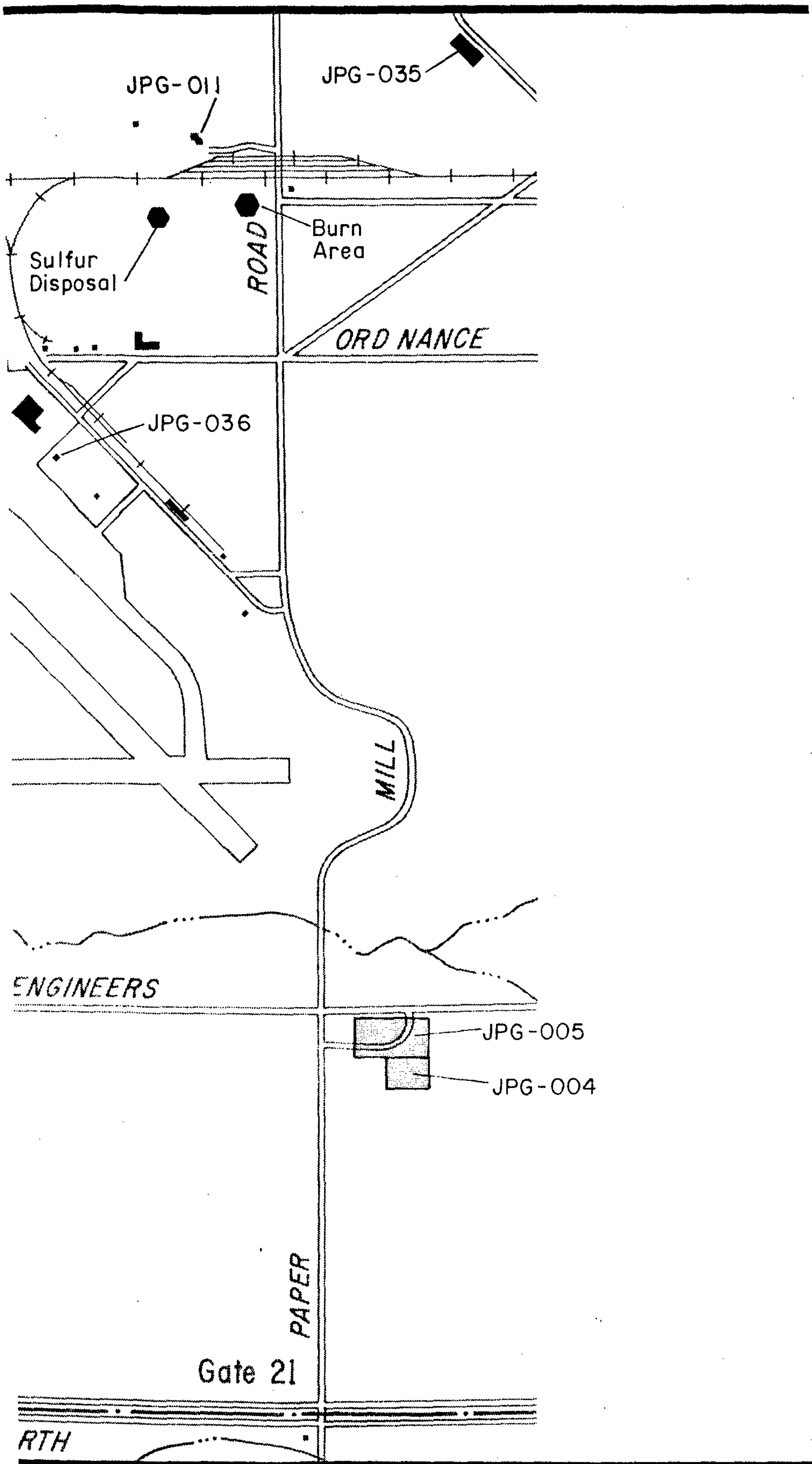

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FIGURE 5
JPG-001,002,003,004,005,007,008,
011,030,036, UXO Contamination, Sulfur Disposa
and Burn Areas

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procedures, which are in place at the water quality laboratory, are designed to facilitate the proper use and disposal of chemicals at JPG and are strictly followed. No evidence of release was observed during the site visit.

3.1.3 Building 177 (Sewage Treatment Plant) - JPG-003

JPG-003 is a 682 square foot STP with associated sludge-spreading acreage (size unknown) (Figure 5). The STP was designed with an approximate capacity of 280,000 gallons per day. The installation has utilized the same STP since its construction in the early 1940s; however, improvements to the existing facilities have been made over the years. Wastewaters that enter the STP undergo primary treatment by transport through a 5,200 gallon wet well/equalization basin and an Imhoff tank for primary sedimentation and sludge digestion. A 60-foot trickling filter, with approximate 20% effluent recycling capabilities, and a 27-foot final clarifier are utilized for secondary treatment of the wastewaters. Secondary solids are recycled to the Imhoff tank for digestion. The digested solids are dried in a 50-foot x 60-foot sludge drying bed. The dry sludge is removed from the drying bed and is disposed of off-post in a sanitary landfill (approximately two (2) dump-truck loads per year). Prior to discharge, the effluent from the STP is periodically tested to confirm compliance with NPDES permit parameter limitations. These parameters are:

- Residual chlorine;
- Dissolved Oxygen (DO);
- Total Suspended Solids;
- Fecal Coliform; and
- Biochemical Oxygen Demand (BOD).

Recent analytical reports are located in Appendix 4. Following compliance testing and analysis, and subsequent chlorination, the STP effluent is discharged to Harberts Creek.

The wastewaters that enter the STP are predominantly sanitary wastewaters (domestic sewage) and a small quantity of industrial wastewater which consists of photographic wastes (170 gallons per day). Because some of the chemicals from the Pako Unit (for film processing) are potentially toxic to the trickling filter organisms, and infrequent, partial kills to these organisms were reported in the 1970s, JPG changed over to a film process in 1980 which eliminated the use of bleaches and cyanides, thereby mitigating potential problems. The STP also treats 200 - 300 gallons per day of boiler blowdown. Until the early 1970s, boiler blowdown was discharged to the storm sewer system. Since then, these wastes have been discharged to the sanitary sewer system.

The boiler effluent is softened by the addition of sodium hydroxide (NaOH), tannin, and cyclohexlyamine.

The possible source materials of environmental concern include the liquid stream discharges of the STP and dry sludge material that was land applied. Now the dry sludge is disposed of off post, in a sanitary landfill. The condition of the sewer lines in the western portion of the cantonment area were previously in poor condition. A facility-wide sewer improvement program was implemented to resolve infiltration problems and resulting violations. Sampling of the sludge is performed prior to disposal. To date, analysis of the parameter of silver has not prevented the off site disposal of the sludge in a sanitary landfill because all laboratory results for EP Toxicity silver have been less than 5.0 ppm. The maximum concentration for EP Toxicity silver, as listed under 40 CFR Part 261, is 5.0 mg/l.

3.1.4 Explosives Burning - JPG-004

JPG-004 is a 2-acre thermal treatment area, once used for the open burning of explosives and other burnables (Figure 5). The materials which were burned at this site included fuses, waste propellant, boxes, lumber and paint residues. The approximate dates of use are unknown. The area is currently completely overgrown with vegetation and is not in use. Waste products resulting from the incomplete combustion of explosives include TNT, DNT, and heavy metals.

The potential contaminant release mechanisms include leaching through soils into groundwater. Presently, migration of material to the air during burning is not of concern as this unit is no longer in use. The surface deposits are sandy to silty soils with low organic content. The relatively high clay content indicates that the potential for migration to the shallow groundwater is minimal. No evidence of burning activity or a release on the ground surface was observed during the site visit. The current exposure potential is low to none. The potential for exposure via the ground surface is negligible.

3.1.5 Landfill - JPG-005

JPG-005 is a 1-acre landfill comprised of filled in trenches (Figure 5). The depth of the trenches is unknown. The approximate dates of use were from 1941 to 1970. The landfill was used as a dumping ground for film refuse from the photographic laboratory. The landfill is totally overgrown, abandoned, and barely discernable. Based on a review of previous reports, the only waste buried at this location was film refuse. The waste film was an

acetate base with minor amounts of silver from the developing process utilized prior to the early 1970s. The potential contaminant release mechanism is the migration of contaminants through soils to the shallow ground water in this area.

3.1.6 Wood Storage Pile - JPG-007

JPG-007 is a 300 square foot, 10 foot high waste pile on an abandoned airport runway (Figure 5). The area is used for the storage of non-hazardous wood debris prior to open burning by employees of the JPG Fire Department. Specific wastes disposed include 4-inch thick plywood sheets used for target practice, boxes, pallets, and used storage crates.

3.1.7 Contaminated Wood Storage Pile - JPG-008

JPG-008 is an open waste pile on an abandoned airfield runway (Figure 5). The area is used for the storage of pentachlorophenol (PCP)-treated wood (JPG receives the wood already treated). The wood is stacked in piles, and includes pallets and crates. The PCP-treated wood is disposed of off-post in a sanitary landfill. The approximate dates of use are from 1975 to the present. PCP by-products have the potential to migrate into the shallow subsurface deposits via surface runoff. The current exposure potential is low, and the potential for exposure via the ground surface is negligible.

3.1.8 Building 333 (New Incinerator) - JPG-011

JPG-011 is a 1,280 square foot, single chamber incinerator with an afterburner operated with Type II fuel oil (Figure 5). The incinerator has been operational since 1978, and is located within a secured building. The unit is used regularly to incinerate solid waste consisting primarily of paper products, debris, and a mixture of polyurethane and iron oxide. The incinerator ash is routinely sampled and analyzed for the following parameters: total cyanide; total sulfide; ignitability; pH; and EP Toxicity metals. The ash is then placed in fiber drums and taken to the construction debris landfill (Gate 19 landfill). There is virtually no potential for materials to migrate out of the building and onto surface soils. The potential contaminant release mechanism is limited to air transport.

3.1.9 Old Fire Training Pit - JPG-030

JPG-030 is a 200 square foot, 2 feet deep surface impoundment (Figure 5). The site is an open pit which is unlined and open to the elements. The site has been used since the 1970s for fire training purposes. Wood debris is soaked with used diesel fuel and other POL products and ignited. The fire fighters then extinguish the open fires. One 55-gallon drum of used diesel fuel is stored at this site.

Waste POL and diesel fuel have the potential to release numerous contaminants during a fire. These contaminants include heavy metals (primarily lead) and solvent. Incomplete combustion or non-volatilization of POL occurs during the training sessions. This residual material is adsorbed onto the surface deposits. Heavy metals are not especially mobile unless under acidic conditions, however, petroleum products are free to migrate unless volatilized or biodegraded. The ground water is approximately 15 to 25 feet below the surface. The potential for surface runoff exists during heavy rains which can cause the training pit to overflow. The soils are generally clay and organic matter, however, making migration of heavy metals somewhat unlikely. During training exercises, smoke and contaminants associated with burning POL's enter the air.

Release to the environment is evidenced by the residue coating from burned material and POL products which covers the pit surface. The pit edges are discolored, and a ubiquitous oily sheen has previously been observed in standing water in the pit indicating POL products are present at this site. The potential contaminants create potential exposure via the surface rather than the subsurface. This factor is dependent upon the mobility of the given material in the subsurface. The U.S. Army Environmental Hygiene Agency (AEHA) Ground water Contamination Survey - Evaluation of Solid Waste Management Units, August 1988, recommended that the surface soils at 1 foot and 5 feet be sampled and analyzed for EP Toxicity heavy metals, volatile and semi-volatile organic compounds, and PCBs. The old fire training pit is no longer used. A new pit, with concrete walls and floor was constructed in 1989. JPG began using the new pit in the autumn of 1989.

3.1.10 Building 305 (Temporary Storage) - JPG-036

JPG-036 is a temporary storage area located in Building 305 (Figure 5). Building 305 is approximately 25 feet x 30 feet, with metal siding. Two (2) 6 foot sliding doors and one (1) exterior exit door provide entrance and egress. The doors do not have spill containment berms. This site has been utilized since 1980 for the temporary storage of hazardous waste materials prior to pick-up and

removal by a private contractor. The wastes stored include spent paint thinner and sludge, Stoddard solvent (Type I), spent TCE, PCB-contaminated oil and transformers, double-bagged asbestos, copper salts, and bagged ash residue resulting from open burning operations. Specifically, the hazardous wastes stored (as reported in an October 1989 inventory) included the items listed in Appendix 5. All of the material is properly labeled and segregated by waste type. The 55-gallon drums and PCB-contaminated transformers are placed in steel spill containment pans. The building operates under RCRA Interim Status. A closure plan has been submitted to U.S. EPA and the State of Indiana. All of the wastes stored at this site are considered hazardous. Storage is limited to 90 days, in accordance with interim status requirements. All of the wastes are properly containerized or bagged. The potential for migration or dispersal is limited to a major spill event. There is no evidence of a release to the environment. Exposure potential is limited to those workers handling the drums or bags of hazardous wastes. Proper handling and safety measures preclude most potential for human exposure.

3.1.11 UXO Contamination South of the Firing Line

In addition to the presence of UXO contamination north of the firing line, UXO is reportedly located south of the firing line (Figure 5). This contamination can most likely be attributed to the rocket, mine, and armor plate testing as well as ammunition dumping which reportedly took place south of the firing line during the WWII era. During excavation activities, several 60 mm mortar rounds were encountered. As with the UXO located downrange, UXO present south of the firing line represents a significant chemical/physical hazard.

Because only a few records indicate the firing position or impact areas used in testing of ordnance south of the firing line, the possible location of UXO in this portion of JPG is poorly defined. Therefore, it cannot be assumed that unexploded ordnance is confined to the designated impact areas illustrated in Figure 3, and may be present virtually anywhere south of the firing line. Several areas are marked on JPG site maps which depict areas as containing duds. As stated previously, ordnance items including duds are not normally recovered after they have been fired. High explosive rounds and duds are virtually never recovered after they have been fired due to the extreme hazards associated with this activity. Many of the inert projectiles, which may have been considered duds, were charged with live fuses and spotting charges and have explosive potential. It is unknown how many of the unexploded rounds and mines have been recovered from these areas, but all land south of the firing line must be considered as containing unexploded ordnance.

3.1.12 Yellow Sulfur Disposal Area

During the Ebasco Enhanced PA site visit, field team personnel identified what appeared to be a yellow sulfur disposal area located south of the new incinerator (Figure 5). The area consisted of a depression in the ground surface, covered with a yellow, powdered substance which emitted a sulfur-like odor. A review of previous studies and discussion with facility personnel did not provide any additional information concerning this site.

3.1.13 Burn Area South of New Incinerator

Nearby the Yellow Sulfur Disposal Area, field team personnel identified a burned area on the ground surface located south of the new incinerator (Figure 5). A concrete pad area, which had conduits containing electrical wiring materials, and the surrounding grassy area appeared to be the site of burning activity. A review of previous studies and discussion with facility personnel did not provide any additional information concerning this site.

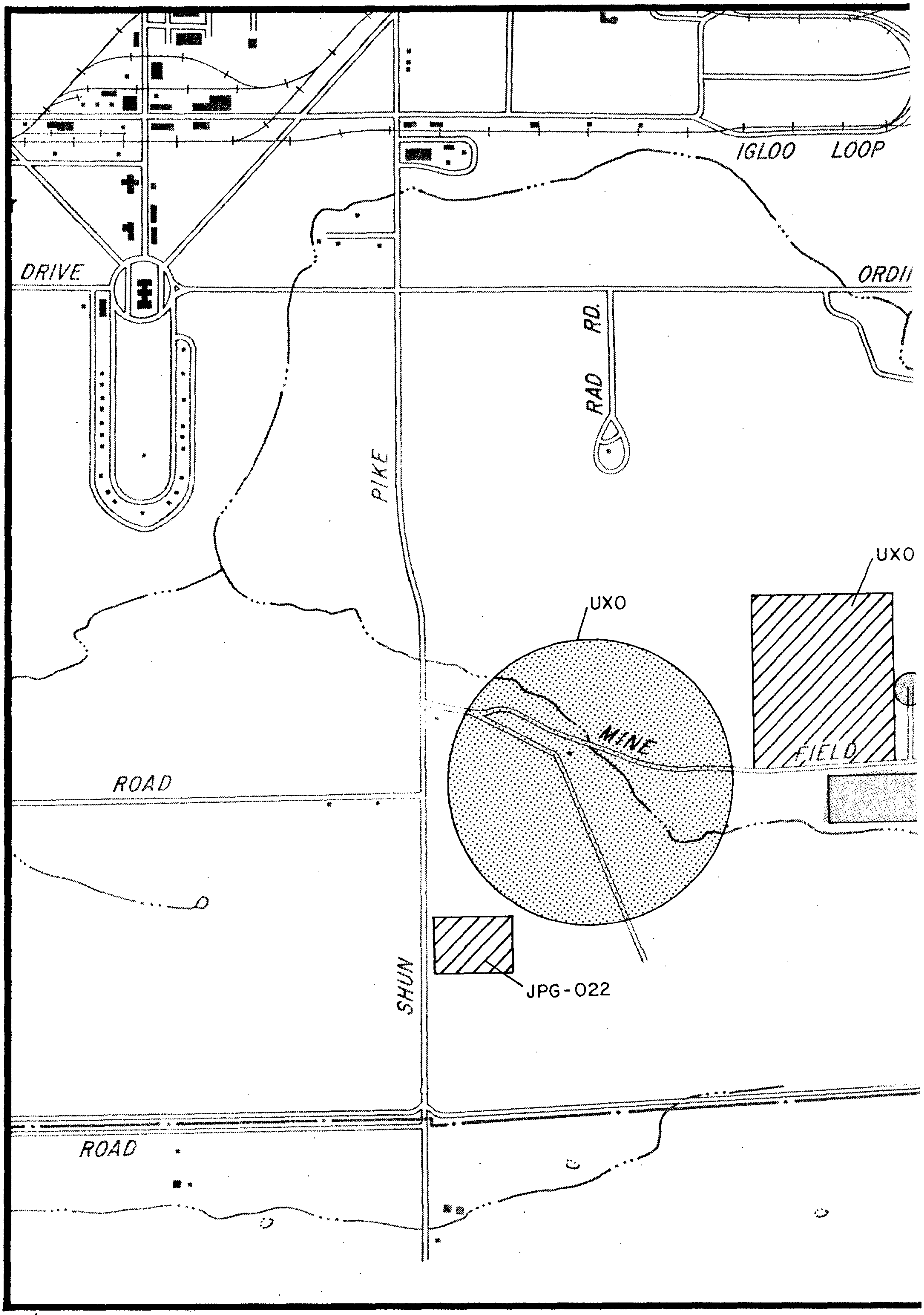
3.2 South of the Firing Line (East Side)

One (1) SWMU and three (3) areas of concern were identified south of the firing line, on the east side (Figure 6).

3.2.1 Open Burning Area - JPG-022

JPG-022 is a thermal treatment area which has been in use since October 1986 (Figure 6). The site operates under RCRA Interim Status for open burning. The open burning area is an open field with secured gates placed far enough away from the burning area to prevent unauthorized access. The four (4) burning trays utilized at this site are constructed of heavy steel with dimensions of 5 feet x 15 feet x 1 foot in depth. The trays have removable locking aluminum covers, and have ports for the drainage of collected rainwater. The areas on both sides of each burning tray have been cleared and graded. This site is utilized for the open burning of waste and unused/unusable propellant deemed unsafe to dispose with incineration (reportedly, 60,000 lbs. per year). The most common material burned is nitroguanadine.

Upon completion of burning activities, the residue ash is analyzed for EP Toxicity metals. The residue ash is disposed of in the Gate 19 landfill upon receipt of analytical results indicating the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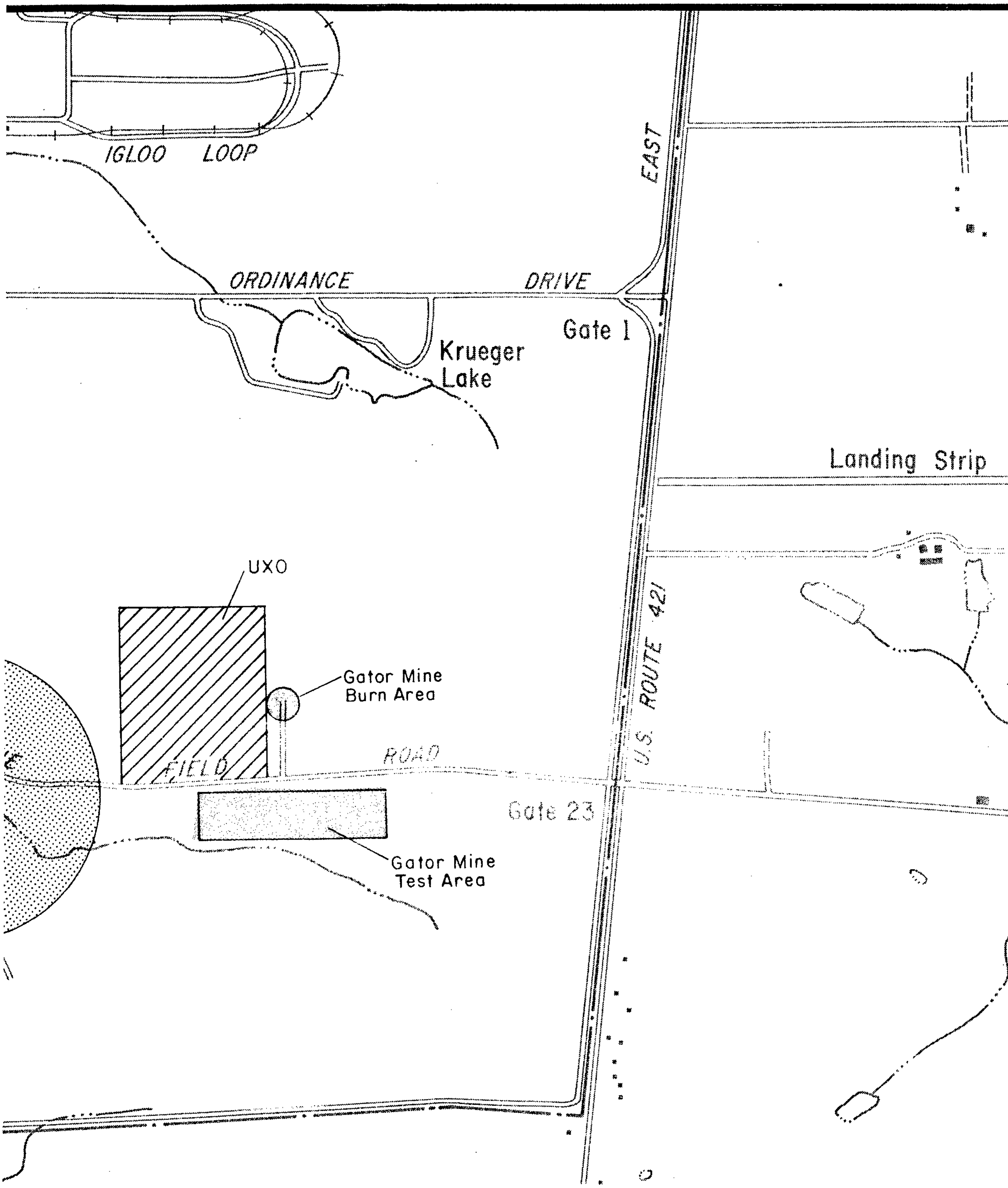

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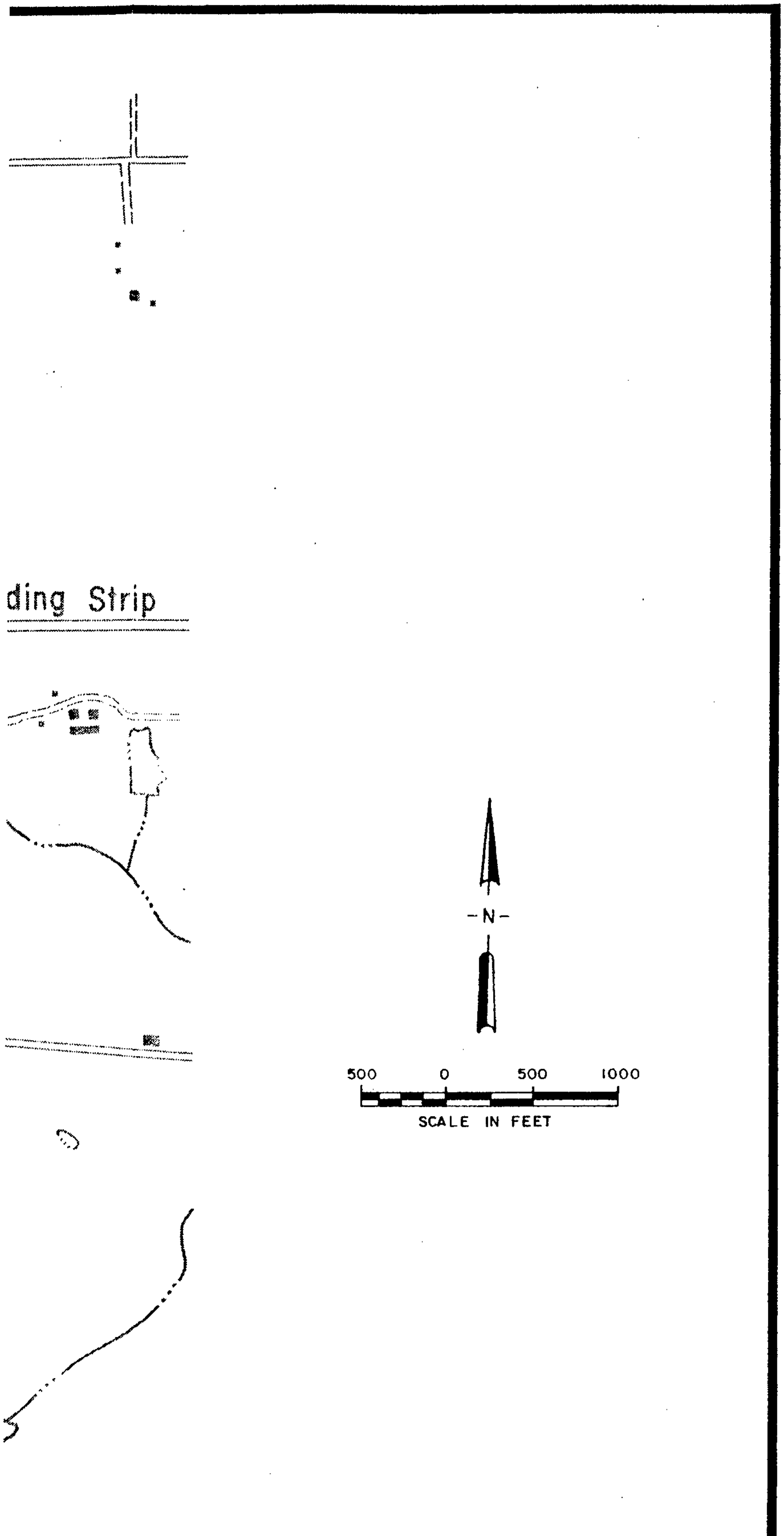

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FIGURE 6
JPG-022, UXO Contamination, Gator Mine Testing Area, Gator Mine Burn Area

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material is not hazardous according to maximum concentration levels listed under 40 CFR Part 261. To date, only one analytical report (July 1989) indicated the presence of EP Toxicity Lead in excess of 5 ppm. This finding was attributed to the failure to remove the lead jacket surrounding the propellant prior to burning. (This ash was disposed of off-post as a hazardous waste in an approved hazardous waste landfill.) Waste products resulting from the incomplete combustion of the propellant include TNT and DNT, and heavy metals from the propellant casing which are potentially hazardous to human health. Explosive and heavy metal byproducts have the potential to migrate through surface deposits under certain environmental conditions.

The potential contaminant release mechanisms include air transport and leaching of contaminants through soils to ground water. The effectiveness of the containment device, location of the burn area, and the standard operating procedures combine to minimize contact between waste ash and the environment. In order for open burning activities to affect the environment, ash residue would have to follow one of the potential exposure pathways: subsurface dissolved components transported through soils to ground water; airborne ash from the burning trays or ground surface settles on surface features such as surface water; and surface ash (or its components) is carried overland by surface runoff. The current practice of using the burning trays prevents impact to soils, and contaminant migration through soils into ground water, ruling out the subsurface as a potential pathway. The design of the containment device includes sides of a height selected to contain any ash residues generated. Standard practice after burning includes immediate recovery of any unburned propellant which may be ejected onto the ground surface in the vicinity of the pans. This material is then burned. In addition, wastes destroyed by open burning at JPG yield small quantities of ash. No evidence of burning activity or a release on the ground surface was observed. The current exposure potential is low. The potential for exposure via the ground surface is negligible due to the use of the burning trays.

Previous releases to the environment occurred when the open burning operations were done on the ground. The area is covered with gravel, and much of the gravel is discolored showing evidence of residue from past burning. Sampling of soils in this area has not been conducted. The potential for exposure from past open burning operations is low since nearly all of the residual material and/or contaminants resulting from the open burning operations is either oxidized. However, the surface soils and shallow ground water could be impacted if the residues from past burning operations are mobile. The U.S. Army Environmental Hygiene Agency (AEHA) Ground water Contamination Survey - Evaluation of Solid Waste Management Units, August 1988, recommended sampling at 1 foot and 5 feet to check for EP Toxicity metals and explosive residues 2,4-DNT, 2,6-DNT, HMX, and TNT.

3.2.2 UXO Contamination

See Section 3.1.11.

3.2.3 Gator Mine Testing Area

The Gator Mine Testing Area (Figure 6) is used for the testing of mines. The contaminant of concern is heavy metals and explosive residues as the potential contaminant release mechanism is leaching of metals through soils to ground water. No sampling has been conducted at this site to determine the concentrations of metals or explosive residues in the soil.

3.2.4 Burn Pile at Gator Mine Testing Area

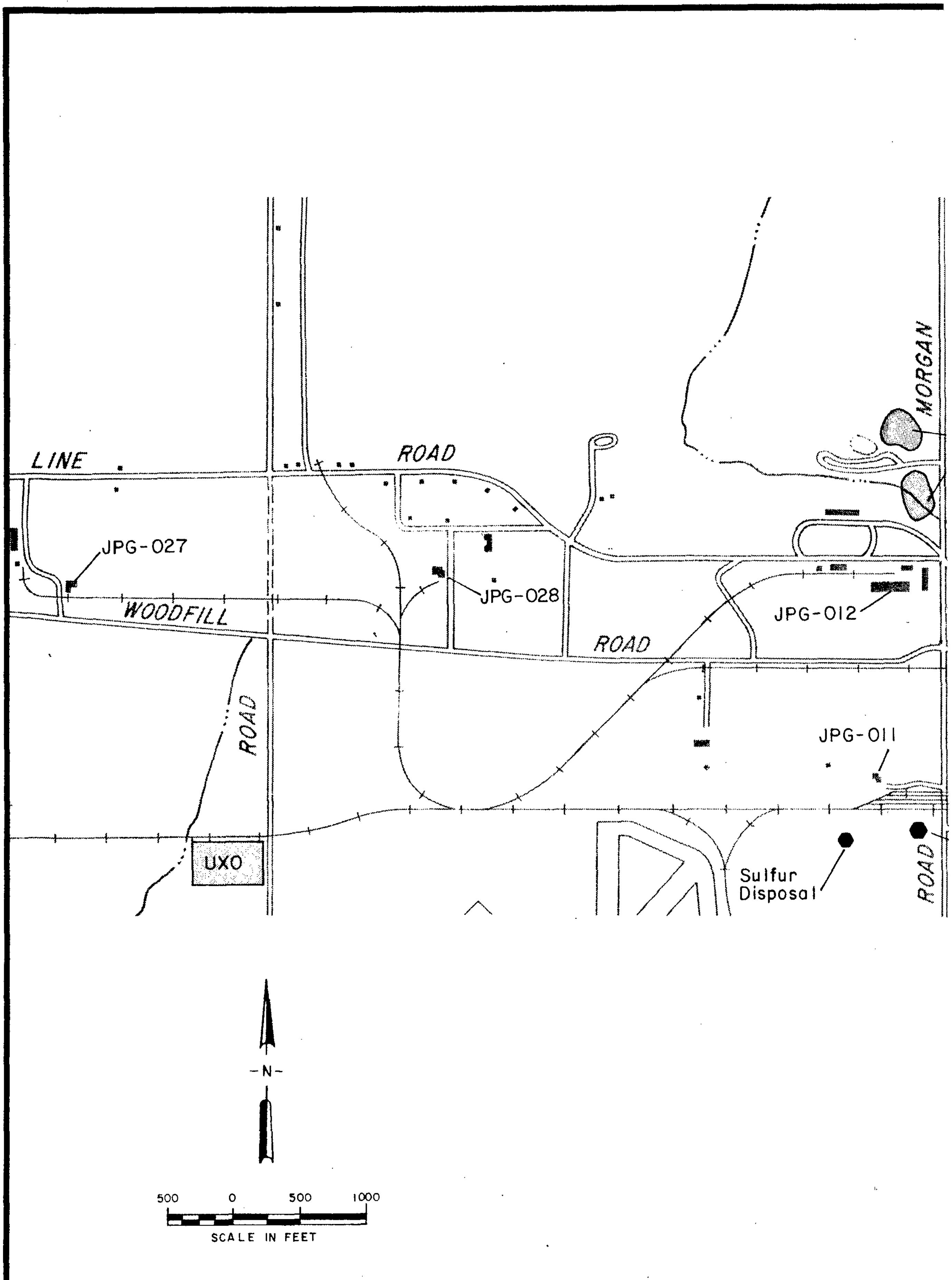
Just north of the Gator Mine area, which is located on Minefield Road, there is an area where scrap wood, wire, and plastic is periodically burned (Figure 6). These materials come from the mine testing program: copper wire coils are sandwiched between plywood and plastic, and are used to simulate the movement of a vehicle over the mines that are being tested. When the mines explode, the wood sandwiches are destroyed. The debris is removed from the Gator Mine pits and is stored across the road until the pile is large enough to burn.

3.3 Firing Line Area

Twelve (12) SWMUs and one (1) additional area of concern are located within the Firing Line Area (Figure 7).

3.3.1 Red Lead Disposal Area - JPG-009

Reportedly, JPG-009 (Figure 7) was an area used for the disposal of paint residuals (red lead) and/or inert filler that contained 60% lead oxide by weight (Component B of the inert filler currently contains iron oxide). Previous studies have indicated that this area is a potentially hazardous waste disposal site, however, repeated site visits have been unable to identify this site.



LINE
ROAD
MORGAN
JPG-027
JPG-028
WOODFILL
ROAD
JPG-012
ROAD
JPG-011
UXO
Sulfur Disposal
ROAD
-N-
500
0
500
1000
SCALE IN FEET

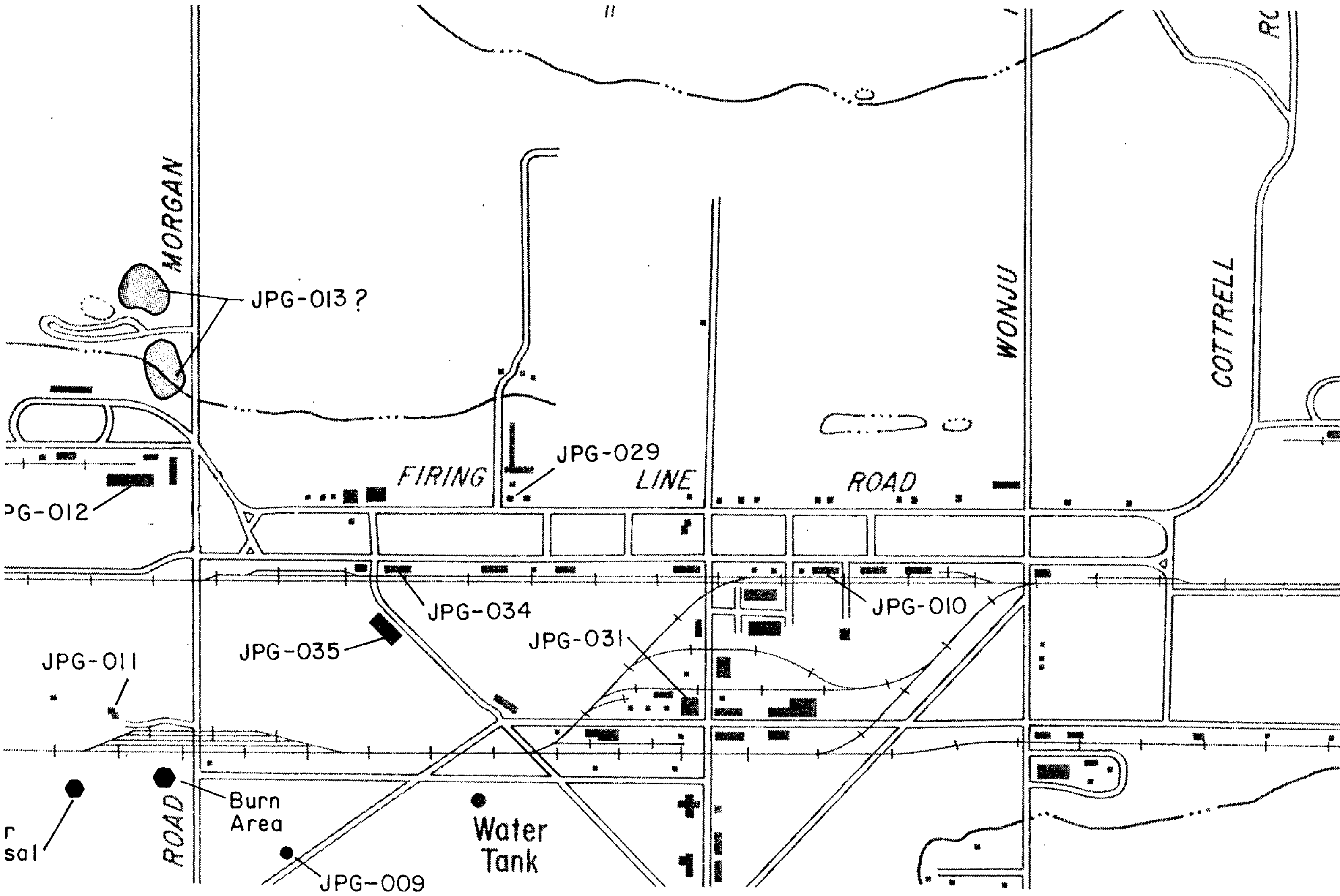


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FIGURE
JPG-009, 010, 012, 013, 0
033, 034, 035, Ammunit

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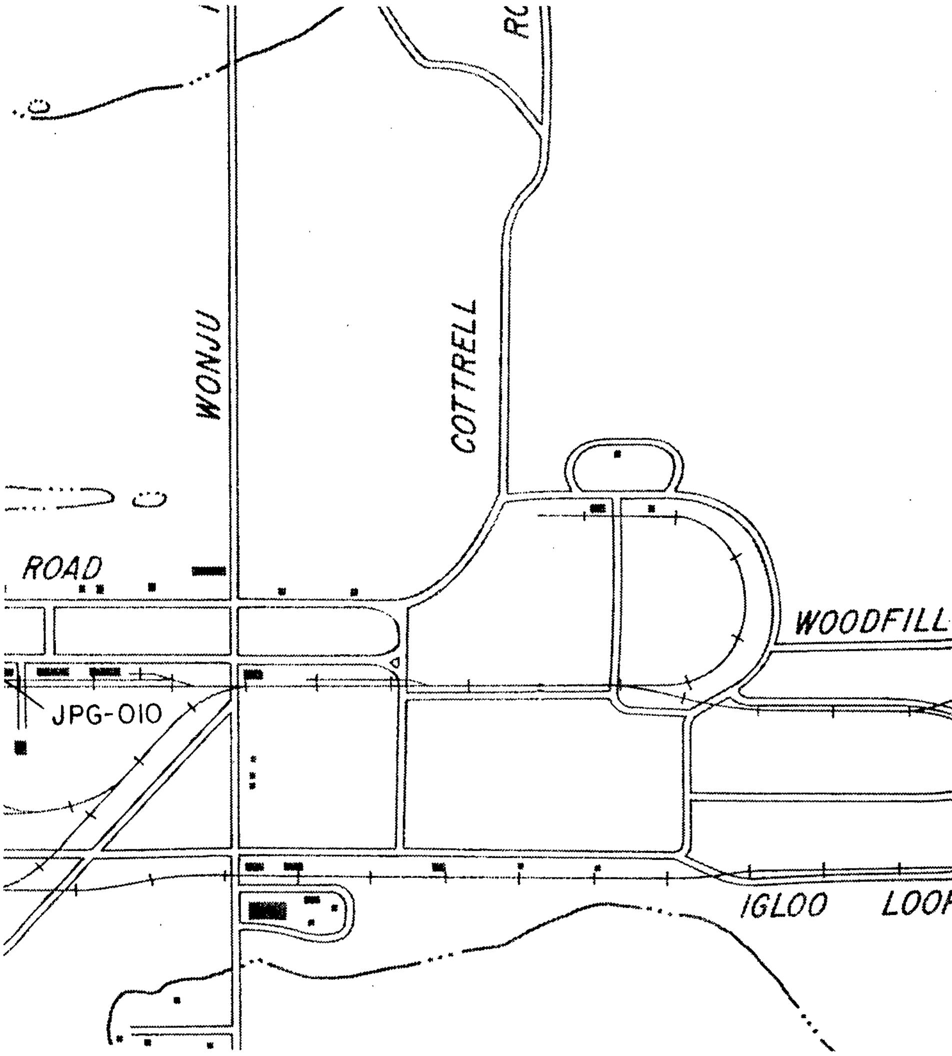

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FIGURE 7
JPG-009, 010, 012, 013, 027, 028, 029, 031
033, 034, 035, Ammunition Assembly Area

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On March 20, 1990, Ebasco personnel interviewed a retiree from JPG. Most of the discussion regarded the location of the red lead disposal areas. The retired employee indicated that red lead was used from 1952 to 1958 and 1961 to 1978. It may have been used prior to 1952. He indicated that red lead has been disposed of at the Gate 19 Landfill (JPG-015), the landfill/burn area at the south end of JPG (JPG-004, 005), and in the gravel between the railroad tracks behind Buildings 202, 148, and 211. Additionally, there was a spill of red lead powder at the small arms range (JPG-012), that was covered over with asphalt or tar.

Red lead is a heavy metal, which may be mobile under certain conditions. Excavation work done in these areas would create an exposure route through inhalation and direct contact. Also, lead may have migrated into the ground water at these sites.

3.3.2 Building 208 - JPG-010

JPG-010 is a 4,929 square foot photographic laboratory which processes, develops, and prints large quantities of black and white and color film for JPG activities (Figure 7). The laboratory consists of several rooms in Building 208. The approximate dates of use of the laboratory are from the mid-1970s to the present. In the past, the laboratory drained waste toner and silver-bearing developers and fixers into the sanitary sewer system. This practice resulted in an occasional disruption of the STP by killing the microorganisms at the filtration unit. This practice is no longer followed. Two silver recovery units are now used to recover silver prior to discharge into the sewer system. All waste fixers and developers (after silver recovery) are diluted at least 20:1 prior to or during discharge into the sanitary sewer system. Early implementation of this dilution procedure consisted of discharging the waste toner into a floor drain and simultaneously turning on a water hose into the drain to dilute the waste. This dilution process was subsequently evaluated by the state regulatory agencies who recommended that the waste toner and developer be diluted prior to pouring of the liquid in the floor drain. Presently the photographic labs operate in an environmentally sound manner. Two silver recovery units are in place, and the labs are clean and neat.

The silver in the waste toner and developer is the main agent of environmental concern. Heavy metals normally bond to organic material in soils and clay and do not migrate appreciable distances unless under acidic conditions. The waste toner and developer is drained into the sanitary sewer system and has little migration potential. The potential for migration into ground water or surface water is minimal.

3.3.3 Indoor Range (Building 285) - JPG-012

JPG-012 is an indoor range which was used to test small arms and/or for training (Figure 7). This area was closed several years ago due to concerns of lead oxides and lead dust contamination which were derived from lead bullets used in the range.

3.3.4 Area for Munitions Demilitarization - JPG-013

Reportedly, JPG-013 was an area used for the demilitarization of munitions (Figure 7). The size of this area, as well as dates of use are unknown. A review of previous studies has indicated that this area is a potentially hazardous waste disposal site, however, repeated site visits have been unable to identify this site. Potential contaminant release mechanisms are unknown.

3.3.5 Building 602 (Solvent Pit) - JPG-027

JPG-027 is a 9 square foot, 4 foot deep cobble-lined solvent pit (Figure 7). The area was utilized as a surface disposal area from 1970 to 1978 for the dumping of used TCE solvent and degreaser, and other unknown solvents. These materials were routinely dumped into the solvent pit for percolation into the pit. The solvent pit is no longer used. TCE and other solvents have the potential to migrate through surface deposits if absorbed into the ground prior to volatilization. The systematic dumping of TCE and other solvents creates a high potential for exposure to ground water. Shallow ground water occurs at approximately 20 to 25 feet in the area. Because the solvents were poured into a gravel pit, much of the material may not have volatilized. This occurrence could allow for migration through surface deposits into the shallow ground water.

A remedial investigation was performed during 1987 through 1988 (Remedial Investigation at Jefferson Proving Ground, Technical Report, A011, 1989) to determine if contamination exists. The RI report indicated that although no VOC contamination was detected during the soil gas investigation, eleven (11) compounds were found in concentrations greater than the detection limits in soil samples collected in the same area. The analytical data acquired from the two (2) soil samples collected near Building 602 indicated that solvents are present in the soils adjacent to the solvent disposal area.

Sample 602-1, collected 3 ft west of the solvent disposal area, contained total concentrations of VOCs in excess of 3.504 ug/g. 1,1,1-trichloroethane and 1,1-dichloroethene were found at levels exceeding their upper certified ranges of 1.0 and 0.5 ug/g,

respectively. Other detected compounds included acetone (0.4 ug/g), 1,1-dichloroethane (0.197 ug/g), 1,2-dichlorethane (0.242 ug/g), 1,2-dichloroethene (0.014 ug/g), toluene (0.481 ug/g), 1,1,2-trichloroethane (0.111 ug/g), and trichloroethylene (0.559 ug/g).

Sample 602-2, collected 3 ft east of the source, contained total VOC concentrations exceeding 1.231 ug/g. This sample, like 602-1, also had levels of 1,1,1-trichloroethane exceeding its upper certified range of 1.0 ug/g. Other compounds found in 602-2 that were also found in 602-1 included 1,1-dichloroethane (0.023 ug/g), 1,2-dichloroethene (0.029 ug/g), 1,1-dichloroethene (0.1 ug/g), and toluene (0.064 ug/g).

The lateral extent of the contaminated soil is unknown, but is expected to be localized in the immediate vicinity of the solvent disposal area. The vertical extent of soil contamination may have extended to the water table. The impact of past disposal practices on ground water quality around Building 602 is unknown as no ground water samples have been obtained for analysis due to the lack of nearby monitoring wells. The RI investigation report recommended that the soil in and around the solvent disposal area be removed or remediated to satisfy federal criteria. Installation of ground water monitoring wells was recommended to determine the horizontal and vertical extent of ground water contamination, strength of the contaminant sources, and ground water flow characteristics. The RI report indicated that three (3) shallow wells should be installed around the immediate site, while an additional well should be installed downgradient of the source areas. Sampling as well as slug testing were recommended.

3.3.6 Building 617 (Solvent Pit) - JPG-028

JPG-028 is a 9 square foot, 4 foot deep cobble-lined solvent pit (Figure 7). The area was utilized as a surface disposal area from 1970 to 1978 for the dumping of used TCE solvent and degreaser, and other unknown solvents. These materials were routinely dumped into the solvent pit for percolation into the pit. The solvent pit is no longer used. TCE and other solvents have the potential to migrate through surface deposits if absorbed into the ground prior to volatilization. The systematic dumping of TCE and other solvents creates a high potential for exposure to ground water. Shallow ground water occurs at approximately 20 to 25 feet in the area. Because the solvents were poured into a gravel pit, much of the material may not have volatilized. This occurrence could allow for migration through surface deposits into the shallow ground water.

A remedial investigation was performed during 1987 through 1988 (Remedial Investigation at Jefferson Proving Ground, Technical Report, A011, 1989) to determine if contamination exists. The RI report indicated that although no VOC contamination was detected during the soil gas investigation, eleven (11) compounds were found in concentrations greater than the detection limits in soil samples collected in the same area. The analytical data acquired from the two soil samples collected near Building 617 indicated that solvents are present in the soils adjacent to the solvent disposal area.

Sample 617-1, collected 2 ft. west of the solvent disposal area, showed total VOC contamination was greater than 4.264 ug/g. 1,1,1-trichloroethane, 1,2-dichloroethene, and 1,1-dichloroethane were found at concentrations exceeding their upper certified ranges of 1.0, 0.5, and 1.0 ug/g, respectively. Other detected compounds included acetone (0.2 ug/g), benzene (0.011 ug/g), chloroform (0.075 ug/g), 1,1-dichloroethane (0.27 ug/g), toluene (0.835 ug/g), and trichloroethylene (0.333 ug/g).

Soil sample 617-2, collected 3 ft. east of the source area, contained total VOC concentrations exceeding 1.559 ug/g. This sample generally had lower contaminant concentrations than did 617-1, possibly a result of having been collected further away from the source area. Only acetone (0.5 ug/g) was found in higher concentrations in 617-2 than in 617-1. As in 617-1, 1,2-dichloroethene was found at a level exceeding its upper certified limit of 0.5 ug/g, but 1,1-dichloroethane and 1,1,1-trichloroethane were not, being present in concentrations of 0.297 and 0.053 ug/g, respectively. Other detected VOCs in 617-2 were benzene (0.009 ug/g), chloroform (0.011 ug/g), 1,1-dichloroethane (0.026 ug/g), toluene (0.108 ug/g), and trichloroethylene (0.055 ug/g). 1,2-dichloroethene and ethylbenzene, while detected in 617-1, were not found in 617-2.

The lateral extent of the contaminated soil is unknown, but is expected to be localized in the immediate vicinity of the solvent disposal area. The vertical extent of soil contamination may have extended to the water table. The impact of past disposal practices on ground water quality around Building 617 is unknown as no ground water samples have been obtained for analysis due to the lack of nearby monitoring wells. The RI investigation report recommended that the soil in and around the solvent disposal area be removed or remediated to satisfy federal criteria. Installation of ground water monitoring wells was recommended to determine the horizontal and vertical extent of ground water contamination, strength of the contaminant sources, and ground water flow characteristics. The RI report indicated that three (3) shallow wells should be installed around the immediate site, while an additional well should be installed downgradient of the source areas. Sampling as well as slug testing were recommended.

3.3.7 Building 279 - JPG-029

JPG-029 is a 9 square foot, 4 foot deep cobble-lined solvent pit (Figure 7). The area was utilized as a surface disposal area from 1970 to 1978 for the dumping of used TCE solvent and degreaser, and other unknown solvents. These materials were routinely dumped into the solvent pit for percolation into the pit. The solvent pit is no longer utilized. TCE and other solvents are liquids with low flashpoints. The solvents are highly volatile; quite often they do not migrate far into the soils before the liquid fraction volatilizes. TCE and other solvents migrate through surface deposits if absorbed into the ground prior to volatilization. The systematic dumping of TCE and other solvents creates a high potential for exposure to ground water. Shallow ground water occurs at approximately 20 to 25 feet in the area. Because the solvents were poured into a gravel pit, much of the material may not have volatilized. This occurrence could allow for migration through surface deposits into the shallow ground water.

A remedial investigation was performed during 1987 through 1988 (Remedial Investigation at Jefferson Proving Ground, Technical Report, A011, 1989) to determine if contamination exists. The RI report indicated that three (3) VOC compounds (1,1,1-trichloroethane, hexane, and trichlorofluoromethane) were found in concentrations greater than the detection limits in soil samples collected on either side of the solvent disposal area. Three (3) ground water monitoring wells were located at Building 279 (Figure 8). Of the three (3) monitoring wells, only ground water samples from MW15 contained VOC contamination in levels exceeding detection limits or Federal criteria. MW15 is located within 10 feet of the solvent disposal pit. The absence of VOC contamination in the two (2) downgradient wells (MW14 and MW16) indicates that significant migration of contaminants has not occurred. The analytical data acquired from the two (2) soil samples and installation of wells near Building 279 indicated that chlorinated and non-chlorinated solvents have been disposed of in the adjacent solvent disposal area. The RI report recommended that the soils near the solvent disposal area be removed to a point where the remaining soil meets "Federal criteria." Because there are no established criteria (contamination limits) for TCE and TCA in soils, it is assumed that the authors of the RI report meant background or "not detectable." The report concluded that ground water contamination is most likely localized, and recommended that a second well be placed near the solvent disposal area to be used as an extraction well to pump the contaminated ground water, and treat the effluent to remove contaminants. In addition, the report recommended that JPG personnel measure the ground water levels in the existing wells on a monthly basis for 1 year to determine if ground water gradient or direction changes occur.

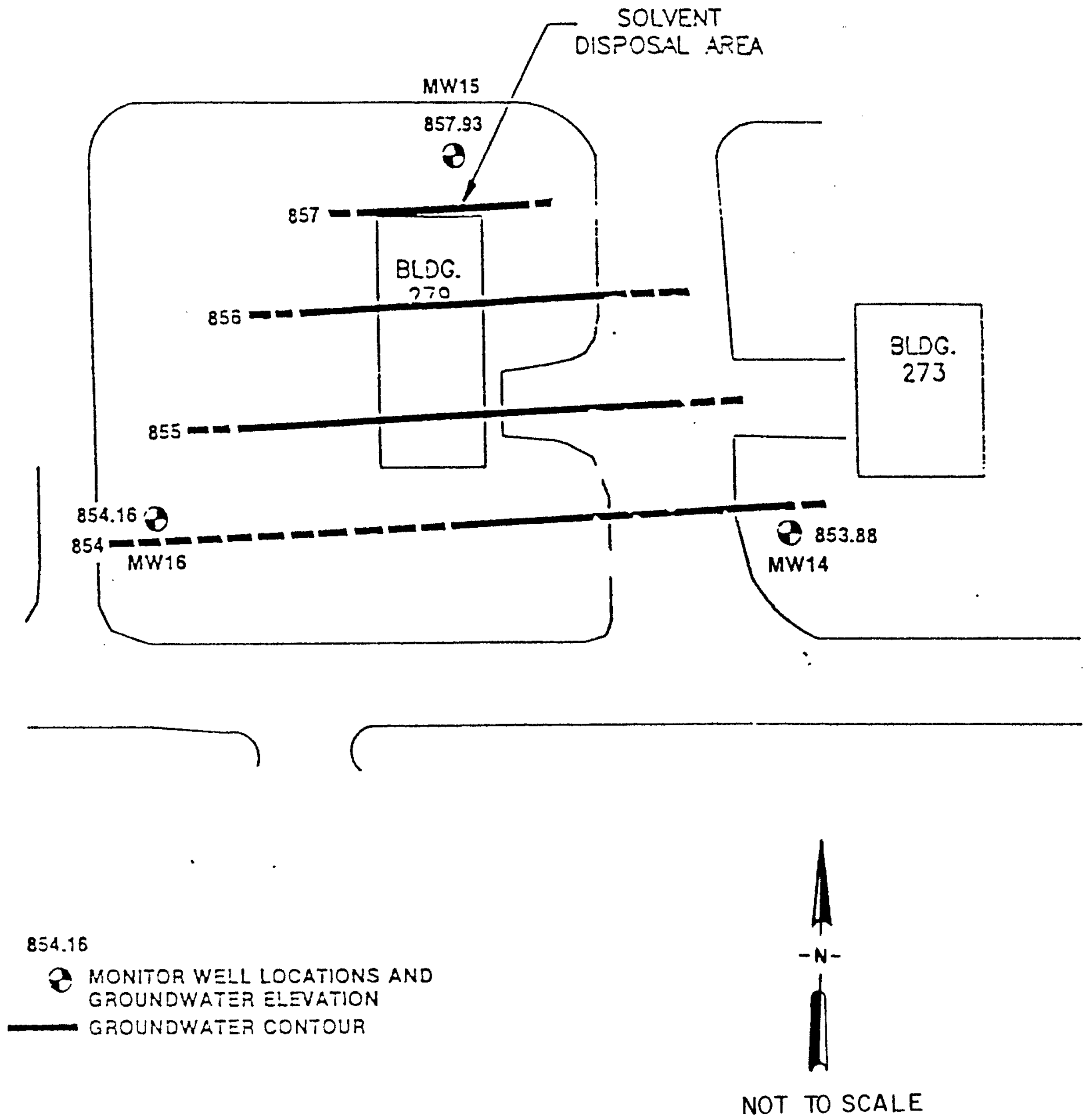

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FIGURE 8
Location of Building 279
Ground Water Monitoring Wells

3.3.8 Building 105 (Temporary Storage) - JPG-031

JPG-031 is a large warehouse/industrial-type facility that houses the metal working facility for JPG (Figure 7). Since the 1970s, the building has been utilized for the temporary storage of varying amounts of waste fluids such as cutting oil, cooling fluids, and napthalenic oils. These products are generated by the work done at the facility and are used by metal workers in cutting metal and refurbishing large gun barrels. The waste fluids are stored in 55-gallon drums prior to their removal and final disposal by a private contractor. The drums are stored on the floor of the shop area. No evidence of a release exists at this location. Cutting oil is nontoxic, however, the napthalenic oils are suspected carcinogens and are considered hazardous wastes when spent. The waste fluids cannot migrate beyond the metal shop unless there is an uncontrolled spill in a doorway. The doorway does not have a spill containment structure. The exposure potential is low to minimal as the only hazard is to workers handling the waste oil and fluid drums.

3.3.9 Temporary Storage - JPG-032

JPG-032 was an area reportedly used for temporary storage. The size of this area, the possible source materials, or potential contaminant release mechanisms are unknown.

3.3.10 Temporary Storage - JPG-033

JPG-033 was an area reportedly used for temporary storage. The size of this area, the possible source materials, or potential contaminant release mechanisms are unknown.

3.3.11 Building 227 (Temporary Storage) - JPG-034

JPG-034 is a large brick warehouse used for repairing and refurbishing large gun tubes and other weapons and weapons parts (Figure 7). The building is also utilized for the temporary storage of waste solvent and oil, which are kept outdoors in a parking lot surface impoundment. The waste solvent (Stoddard types I and II), used oil, and small amounts of used aerosol cans are stored in 55-gallon drums. When the waste drums are full, the DRMO contractor picks up the drums for proper disposal.

The solvents and waste oil have the potential to migrate into the shallow surface deposits and shallow ground water in the event of a spill. Most of the solvents would volatilize in a spill

situation unless conditions allow for rapid adsorption by the surface deposits. Minor spillage has occurred at this location during handling of drums.

3.3.12 Building 186 (Temporary Storage) - JPG-035

JPG-035 is a large warehouse used as a maintenance garage for repairing heavy equipment and vehicles (Figure 7). The building is also utilized for the temporary storage of Stoddard solvent (Type II), and No. 1 fuel oil in small above-ground storage tanks. Used oil is stored in an underground storage tank located immediately south of the building. Empty drums on pallets, which once contained used oil, are also located outside. Several batteries which are not drained of fluid are located on pallets in the same area. Light and heavy scrap metal storage containers are also located in this area. The temporary storage area is partially bermed. An oil separator pit located adjacent to the storage area is manually skimmed of oil, and water is discharged to the sanitary sewer system. A secondary oil separator pit also exists. The primary pit is visible from the ground surface, as an open grate covers the openings of the pit (much like a storm sewer catch basin), while the secondary pit has a heavy steel cover. The solvents and oil have the potential to migrate into the shallow surface deposits and shallow ground water in the event of a spill. The surface deposits consist of silts, clays, and loam. Ground water exists approximately 15 to 25 feet below ground level. Most of the solvents would volatilize in a spill situation unless conditions allow for rapid adsorption by the surface deposits. Minor spillage exists at this location during handling of drums. This occurrence presents the highest exposure potential, which is realistically low.

3.3.13 Ammunition Assembly Areas

Several buildings at JPG are utilized for the assembly of munitions (Figure 7). Various projectiles containing powdered explosives are assembled in strict accordance with applicable safety protocols. However, the possibility does exist that explosive residues are present on building floors and ceilings, and in building HVAC systems. Though sampling for these residues has not been performed, the potential hazard the residues might pose, if present, is minimal.

3.4 North of the Firing Line

There are eleven (11) SWMUs and three (3) additional sites identified located north of the firing line (Figure 9).

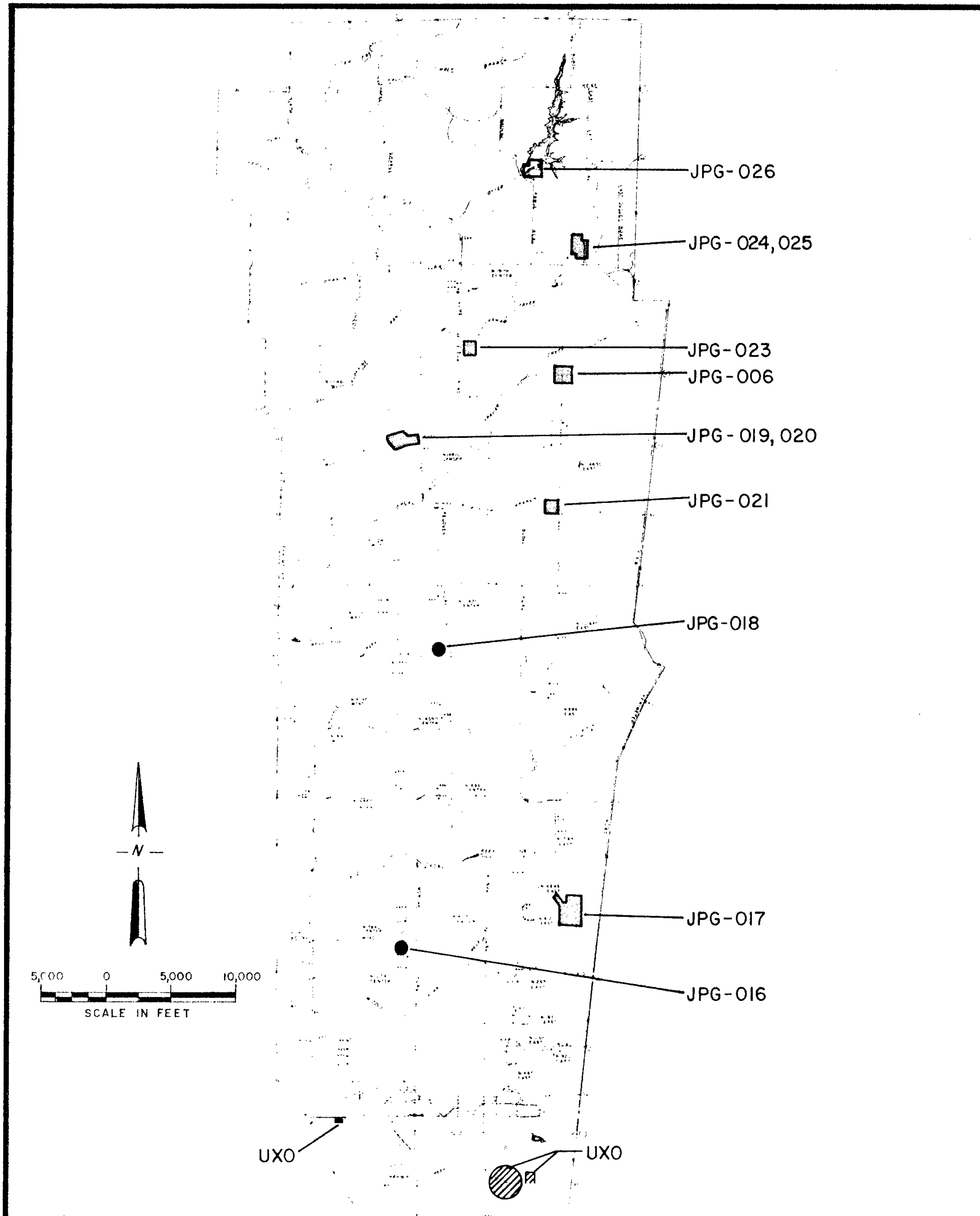

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FIGURE 9
Location of JPG-006,016,017,018,019,020,021, 023,024,025,026, UXO Contamination and DU Impact Area

3.4.1 Explosives Burning Ground - JPG-006

JPG-006 is an old thermal treatment area which is no longer used (Figure 9). Previously, the area was used for the open burning of powdered explosives on the ground. However, there is no trace of open burning on the ground in the southwest corner of the area. The site contains low-lying areas which are filled with water. The potential contaminant release mechanism is the leaching of contaminants through soils to ground water.

3.4.2 Ordnance Disposal Site - JPG-016

JPG-016 is an ordnance disposal site, approximately 60 square feet in size (Figure 9). This site was previously utilized for the disposal of munitions-related components, including chemical explosives. The area consists of a water-filled pit which contains ordnance. It is unknown whether the shells are explosive or not. The materials are metal shells which may contain explosives. Over time, lead, chrome, TNT, and/or DNT may leach into the surrounding soils. It is unknown if a release has occurred, and the potential for exposure from the metals and explosives is unknown. The physical hazard the presence of the shells represents is the most significant concern. The potential for these shells to detonate is unknown.

3.4.3 Landfill - JPG-017

JPG-017 is an abandoned landfill of unknown depth (Figure 9). The landfill was utilized from the early 1960's to 1981 for the burial of inert munitions-related materials (metal parts) from firing range and testing activities. Buried wastes and water-filled pits containing inert shells make up this 8-acre site. Metal plates have been placed over sections of the landfill as truck turnarounds. The landfill is totally overgrown and barely visible. The materials in the landfill are metals that may contain explosives or otherwise hazardous constituents. Metals can potentially leach over extended periods of time. Ground water is relatively shallow in this area, and may be a release pathway to the environment.

3.4.4 Abandoned Well Disposal Site - JPG-018

JPG-018 is an abandoned water well used for the disposal of munitions-related materials (Figure 9). Reportedly, 100 to 200 riot control grenades were dumped in this farm well. The present condition of this site is that the 3-foot diameter well is filled

with water and the munitions cannot be observed. The well is no longer utilized for disposal of any type of material. Ammunition can be seen on the ground surface in the vicinity of the well.

It is unknown whether the grenades are explosive or not. The materials are metals and may contain explosives. Over time, the riot control agent (CS/CN) if released would hydrolize, while the ignitor/pyrotechnic mix and metals may leach into the ground water as there is a direct migration pathway. There is no visual evidence of a release; however, there is a possibility of exposure from the metals and explosives if leaching has occurred. The presence of the grenades and their current condition is the most significant concern. The potential for these grenades to detonate is unknown.

3.4.5 Sediment Bottom Munitions Test Pond - JPG-019

JPG-019 is a previously used, sediment bottom munitions water-filled test pond which is dammed on its western edge (Figure 9). This site was reported to be contaminated in the 1960's with munitions and the herbicide Ureabor. The dam has recently been breached, resulting in the partial draining of pond water to a nearby tributary. Though this site reportedly contains munitions-related materials, the presence of ammunition beneath the water surface cannot be visually observed. It is unknown whether the shells are potentially explosive. Over time, lead and possibly chrome, TNT, and/or DNT may leach into the surrounding soils. There is no evidence of a release but there is a possibility of exposure to the metals and explosives. The U.S. Army Environmental Hygiene Agency (AEHA) Ground water Contamination Survey - Evaluation of Solid Waste Management Units, August 1988, indicated that the status of JPG-019 was that it was no longer visible and/or has been cleaned up.

3.4.6 Macadam Lined Test Pond - JPG-020

JPG-020 is an approximately 1/2-acre Macadam (asphalt) lined test pond (Figure 9). The pond was drained and no munitions-related materials were found. The U.S. Army Environmental Hygiene Agency (AEHA) Ground water Contamination Survey - Evaluation of Solid Waste Management Units, August 1988, indicated that the status of JPG-020 was that it has been cleaned up. The Environmental Protection Agency has no recommendations for further work at this site.

3.4.7 Abandoned Well Disposal Site - JPG-021

JPG-021 is reportedly an abandoned cistern used for the disposal of fuses (Figure 9). A review of previous studies indicated that this site was a potentially hazardous waste disposal site, however, it is unidentifiable. The U.S. Army Environmental Hygiene Agency (AEHA) Ground water Contamination Survey - Evaluation of Solid Waste Management Units, August 1988, indicated that the status of JPG-021 was that it was no longer visible and/or has been cleaned up. The site visit performed as an element of the Enhanced Preliminary Assessment did not identify the location of this site or the presence of munitions-related materials. If present, the materials are metals and may contain explosives. Over time, lead and possibly chrome, TNT, and/or DNT may leach into the ground water as there may be a direct migration pathway.

3.4.8 Open Detonation Area - JPG-023

JPG-023 is a 125-acre thermal treatment unit (Figure 9). The site operates under RCRA Interim Status for open and above ground detonation. The area is an open field with an open burning cage approximately 5 feet x 25 feet x 6 feet, with 1-inch heavy steel mesh. Open detonation operations occur approximately 10 times per year. JPG utilizes the open burning cage to dispose of spent or unusable fuses, detonators, primers, and grenades. There is a 24 hour waiting period between open burning and detonation activities. Non-electric detonation is performed by JPG employees who ignite the material with a burning fuse. The open detonation area is well managed. Debris on the ground consists of inert projectiles and metal fragments.

The wastes disposed of at the open detonation area are unexploded ordnance (rarely high explosive). The residual waste products consist of ash, fused or unfused ammunition and scrap metal casings and fragments. Propellants from the above devices and a small amount of actual explosive are also present. The residual propellants and explosives are potentially contaminated with waste TNT, 2,4-DNT, 2,6-DNT, and other explosive byproducts. The migration and dispersal characteristics of these materials varies with soil conditions and the solubility of the waste material. Ground water is approximately 15 to 25 feet deep in the open detonation area. The direction of the ground water flow is generally from the northeast to the southwest. The surface soils range from clay to silty clay and loam, allowing for relatively slow migration toward the shallow ground water. No perennial streams exist in the open detonation area; thus, migration caused by surface runoff is negligible. Dust and minor amounts of particulate matter from open detonation most likely enter air pathways during operations of open detonation and open burning in the burn cage. No evidence of a contaminant release exists at the

open detonation area. The area is cratered with depressions caused by ongoing operations, but the debris is minimal and limited to inert metal fragments and projectiles.

3.4.9 Landfill - JPG-024

JPG-024 is a 1-acre, abandoned landfill of unknown depth (Figure 9). The landfill was utilized until the early 1980s for disposal of sanitary waste from the Old Timbers Lodge. Waste from the lodge included putrescibles, paper, and other non-toxic household-type wastes. No dangerous physical or chemical characteristics exist for this type of waste. It has also been claimed that ammunition, extra primers, and other ordnance related materials were disposed of at this site. This may be a reasonable assumption, because there is a gun position/target at the end of the access road. Contaminants from the wastes buried in this landfill have minimal potential to leach and subsequently migrate into the soils or ground water in detectable amounts as the wastes are non-toxic and inert. Ground water is the only potential pathway for migration, however, no evidence of leachate or other releases exist at this site.

3.4.10 Landfill - JPG-025

JPG-025 is a 1-acre, abandoned landfill of unknown extent (Figure 9). The landfill was utilized for approximately 2 years for the disposal of sanitary waste and construction-type debris by campers and construction workers. The landfill is no longer utilized, is covered with silty clay, and overgrown with tall weeds and grasses as well as seedling trees. There is no evidence of detrimental impact on vegetation. Reportedly, the wastes buried at this site were neither hazardous or toxic, however, like JPG-024, ammunition, fuses, and other ordnance may have been disposed here. Though ground water is shallow in this area, the soils and cover material are clays and silty clays. Thus, the potential for subsurface migration is negligible. Surface water is not present in this area. There is minimal potential for exposure as long as the area remains undisturbed and vegetation continues to thrive.

3.4.11 Landfill - JPG-026

JPG-026 is a 1-acre, abandoned landfill of unknown extent located at the foot of Little Otter Dam (Figure 9). The landfill was utilized for approximately 2 years for the disposal of sanitary waste and construction-type debris by campers and construction workers. The landfill is no longer utilized, is covered with silty clay, and overgrown with tall weeds and grasses. Reportedly, the

wastes buried at this site were neither hazardous or toxic. Though ground water is shallow in this area, the soils and cover material are clays and silty clays. Thus, the potential for subsurface migration is negligible. There is minimal potential for exposure as long as the area remains undisturbed and vegetation continues to thrive.

3.4.12 UXO Contamination North of the Firing Line

Land north of the firing line consists of approximately 51,700 acres (Figure 9). Several test range impact areas located north of the firing line contain varying amounts of UXO (Figure 3). Parts of this area, approximately 8,600 acres have been utilized as designated impact or target areas for test-fired ordnance. This represents the primary area known to be heavily contaminated with UXO. Since 1941, the mission of JPG has been the testing and special studies of ammunition and weapons systems and components (Appendix 1). Potential contaminants include propellants, mines, ammunition, cartridge cases, artillery projectiles, mortar rounds, grenades, tank ammunition, bombs, boosters, and rockets. During WWII, firing was performed with a higher percentage of high explosive (HE) rounds than since 1950. The demands placed upon JPG during the war precluded the time and expense involved in the special loading of inert rounds. Very little data exists concerning the bomb testing conducted during the WWII era. It is unknown how much unexploded ordnance resulted from that testing period. Additionally, munitions were fired by the Air National Guard onto the gunnery range on a regular basis. It is unknown how much UXO resulted from this activity.

There is limited information available relative to location or distribution of the test rounds. JPG's mission has been to evaluate the performance of the round, not its final resting place. Very few requirements for recovery are in place, and those rounds which must be recovered are usually fired at a higher angle to facilitate recovery. It was not until the late 1960's and early 1970s that this type of information was recorded in the Firing Records on a routine basis. Therefore, it cannot be assumed that unexploded ordnance is confined to the identifiable, designated impact areas and may be present virtually anywhere down-range. Additionally, test fired items may have fallen short, flown long, drifted left or right, skipped or ricocheted when they hit the ground. Furthermore, test firing records through the 1970s did not specify either the intended impact field or the firing point from which the test was performed. JPG staff estimate that approximately 23 million rounds have been fired since 1941. JPG also estimates that approximately 1.4 million of the rounds did not explode. Ordnance items are not routinely recovered after they have been fired. Recovery of UXO has been limited due to the extreme hazards associated with that activity. Another 6.9 million

rounds were inert projectiles, many of which were charged with live fuses and spotting charges with explosive potential. The majority of the unexploded rounds have not been recovered from these areas, so virtually all land north of the firing line must be considered as containing UXO.

Because the rounds that failed to reach the designated impact field are not accountable in terms of location, it is unknown whether they functioned and distributed their payload over a wide range, or landed intact and remain in the ground. Several ICM rounds fall into this category. An ICM is an artillery projectile which, instead of being filled with a bursting charge like a standard high explosive round, is loaded with a variety of smaller devices called submunitions. These submunitions include different types of antipersonnel and anti-armor grenades and mines. ICM projectiles routinely impact the ground, travel up to several hundred feet under the surface, exit the ground and fly up to 1,500 meters farther before again impacting. These are empty 155MM and 8 IN rounds, which have dropped a payload of sub-munitions prior to impact. The estimate of rounds at or above the depth of 36 inches is based on the premise that most of JPG's tests are fired at relatively low trajectories; especially the tank and propellant tests. According to observations made during recovery operations, projectiles have the tendency to turn toward the surface near their penetration limits. Additional rounds may be dislodged from deeper in the soil and thrown to the surface. This occurrence is experienced in both the DEMIL operations and in the testing of HE rounds. In fact, old White Phosphorus rounds were ignited during a recent mortar test after being hit and exposed to the air by the incoming inert rounds.

An obvious, significant physical hazard is created by the presence of the UXO north of the firing line and its distribution well beyond the impact fields. The explosive force produced by detonation of a single fuse is sufficient to kill a person even if there were no other explosive components present. The presence of unexploded ordnance represents not only the hazard of detonation if disturbed, but chemical hazards associated with munitions containing high explosives, white phosphorus, or depleted uranium. According to the Report to the Governor, U.S. Army Jefferson Proving Ground, Madison, Indiana, April 20, 1989:

- "<u>White Phosphorus</u> - The presence of munitions containing white phosphorus, which ignites on contact with air and is difficult to extinguish, will increase both the cost and hazards of ordnance cleanup. The white phosphorus can remain unburned for many years under the ground only to ignite when disturbed and exposed to the atmosphere.

- <u>Depleted Uranium</u> - "...More than 60,000 kg of low-level radioactive depleted uranium penetrators were fired on a 2-square mile area that also contains explosive

> ordnance. Only an estimated 20 percent (12,000 kg) has been recovered in the limited cleanup conducted twice each year. ...Closure would require addressing concerns associated with radioactive decay, including production of radon, as well as the hazards from explosive ordnance."

The toxicity of DU is of environmental concern. Migration of these materials, however, is of relatively less concern than their potential to detonate or ignite. The low level radioactivity of the depleted uranium is readily detected and does not present the imminent threat that unexploded general ordnance items do. The leaching of lead from testing of the XM198 Howitzer does not pose a significant problem. Water samples indicate that test site lead concentrations were well below the .05 mg/l maximum concentration limits. The soil has a low to moderate permeability with the deeper clays being fairly impervious, thus slowing the migration of potentially contaminating materials. The permeability of one (1) soil sample was found to be 0.11 cm per day; this value indicates a slow migration rate. Low permeability soils at the surface allows for the collection of standing water. These puddles could be a possible pathway for toxic and nontoxic substances to enter the ground water. However, the geologic conditions at JPG are such that potential subsurface migration of contaminants would be relatively slow.

Nearly all rounds found during any type of clearing operation must be considered to contain an explosive device, even if it is no more than a live fuse. Markings, paint, and/or stampings utilized to identify particular types of ordnance are presently obliterated due to ground impact and weathering. Markings may identify only that particular component as inert, while other components may be HE. This is illustrated by the fact that live fuses and spotting charges are frequently used on projectiles stamped inert.

3.4.13 Depleted Uranium Contaminated Area

Depleted uranium (DU) rounds are fired north of the firing line (Figure 9). More than 60,000 kg of low-level radioactive depleted uranium penetrators were fired on a 2-square mile area (Figure 10).

The firing of this type of round has caused the clearing of a narrow strip of land, which was already contaminated with UXO. DU rounds, or penetrator rounds, utilize nonexplosive projectiles. The penetrator itself is comprised of a DU body, a nose cone, and fins to stabilize the round in flight. This type of round is fired with a sabot (a device which keeps the penetrator centered in the barrel of the gun), which sheds as soon as the round exits the gun tube. It contains no explosive components. Depleted uranium is used because of its exceptionally high specific gravity, which

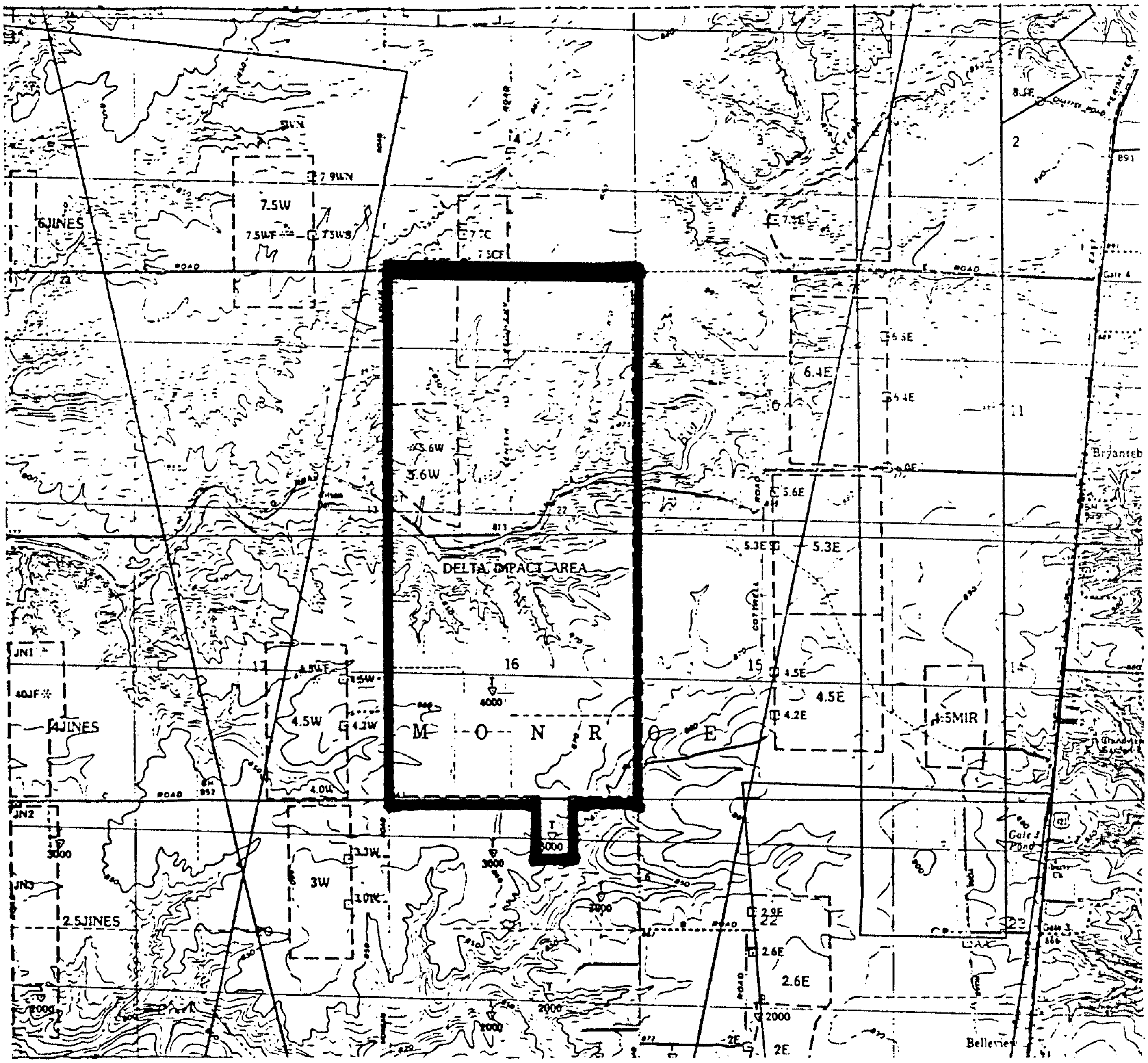
gives it a greater mass than lead or steel. The majority of DU rounds remain intact upon firing though some do break into large pieces on impact. The penetrators tend to skip and ricochet when they impact the ground because they are fired at a high initial velocity. This causes them to travel a considerable distance downrange.

Only an estimated 20 percent (12,000 kg) has been recovered in the limited cleanup efforts conducted twice each year. Potential release mechanisms include the leaching of radioactive contaminants through soils to ground water. The DU penetrators oxidize in air forming uranium oxides that can flake off the penetrators, and remain in the soil after the penetrators are removed. Sampling in the affected area occurs approximately every six (6) months. Soil, sediment, and ground water samples (collected from 11 monitoring wells) are collected and analyzed for radioactivity (Figure 11). Analysis performed thus far indicates that while the DU rounds represent a low-level radioactive hazard, radioactive materials have not migrated through soils to ground water.

Cleanup of the areas impacted by the DU penetrators must address the potential risks and concerns associated with DU such that it represents a toxicological hazard as a heavy metal, a low-level radioactive hazard, as well as the hazards represented by the UXO also located in the area. Specifically, closure would necessitate the assessment of the potential impact of radioactive decay, which includes the production of radon. A follow-up study would be required to evaluate the hazards presented by radioactive residuals left on-site.

3.4.14 Forest Fires

Forest fires reportedly occur north of the firing line due to the impact of detonating munitions. Releases from forest fires consist primarily of particulates, CO, CO_2, and some oxides of nitrogen. Forest fires represent a potential source for contaminant releases to the air. However, considering the infrequency of their occurrence, forest fires will have minimal impact on air quality.



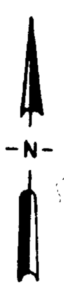


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FIGURE 10
Depleted Uranium Impact Field

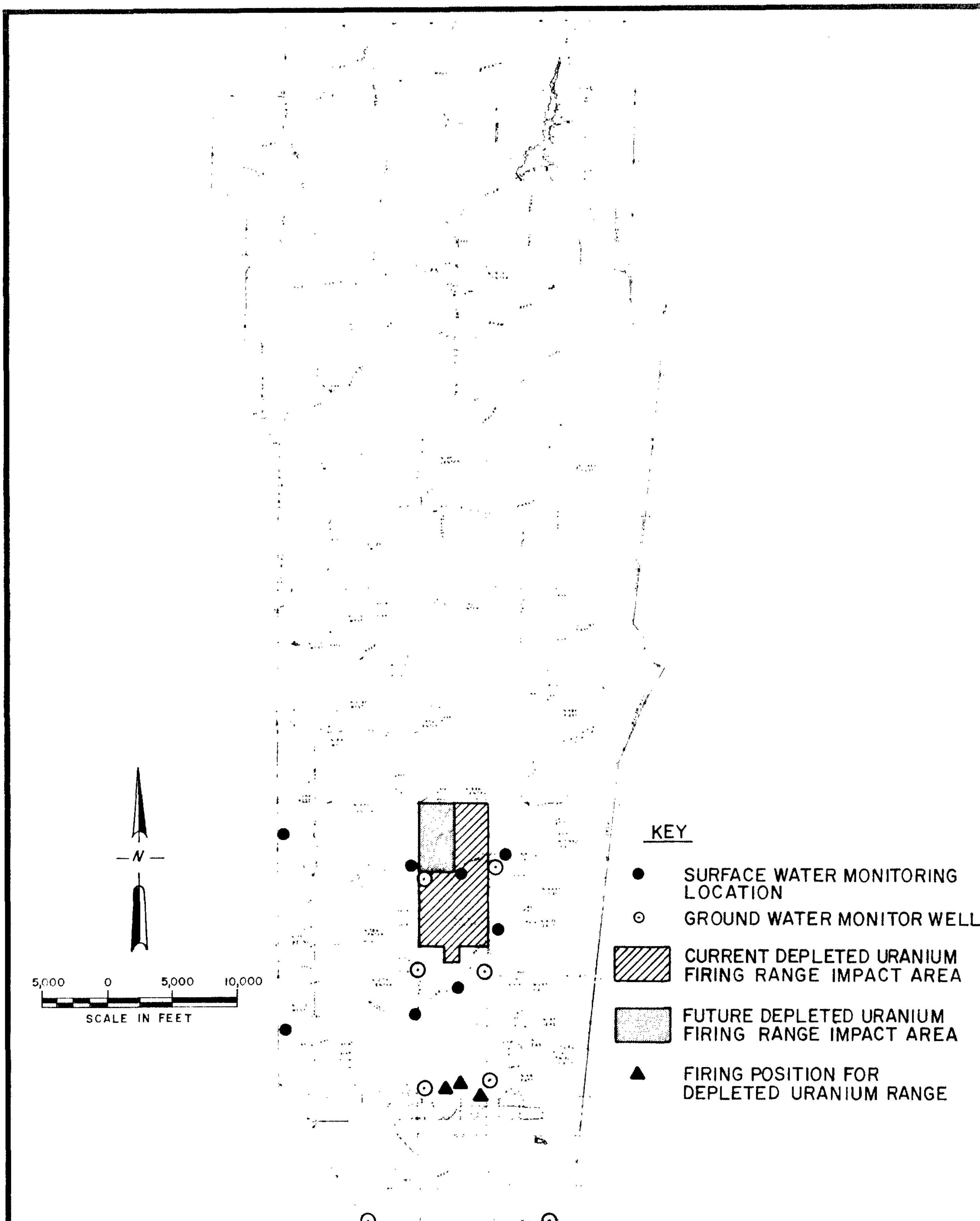

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FIGURE 11
Location of Ground Water Monitoring Wells at the DU Impact Area

3.5 Gate 19 Area

Two (2) SWMUs are located within the Gate 19 Area.

3.5.1 Burning Ground - JPG-014

JPG-014 is a 1/2 acre thermal treatment area, located immediately south of the Gate 19 landfill, which was once used for the open burning of construction debris and waste POL (Figure 12). The area consists of an open field surrounded by trees, and is now overgrown with tall grass and other vegetation. Evidence of open burning at this area was not observed during the site visit. Historical records of this area are vague; however, aerial photographs show liquid-filled trenches and mounded material during its use from the 1950s to the 1970s. In 1981, this site (and the adjacent Gate 19 landfill) was reported to have received of trichloroethylene (TCE) and paint. Though this area is no longer used for burning of any type of material, the reports of TCE and paint dumping indicate that a release to the environment may have occurred in this area.

Potential contaminant release mechanisms include air transport and leaching through soils to ground water. During open burning any by-products most likely entered the air and were dispersed with the prevailing winds. The potential for ground water contamination, however, is strong. TCE is a highly mobile solvent that can migrate into ground water. The heavy metals in waste paints are not mobile, and bond to organic material in sands and clays unless the conditions are acidic. Ground water in this area is approximately 25 feet below the surface. The potential for contaminants to reach the ground water is moderate; however, the clay soils in this area may be acting as a confining layer and preventing contaminant migration. The ground water flow direction is generally from the east to west, which could result in the migration of contaminated ground water outside the installation boundary, potentially contaminating private drinking water wells in the surrounding area. However, analytical results from the remedial investigation, in conjunction with previous studies, indicates that the migration of contamination in the ground water has not occurred, and that little if any ground water contamination is actually present in the vicinity of the burning ground. The downgradient monitoring wells, located along the West Perimeter Road, are placed such that any contaminant plume originating from the burning ground that might potentially migrate off-post would be detected. No such plume has been detected.

In 1988, fourteen (14) ground water monitoring wells were installed under a program to characterize this area and the Gate 19 landfill. Analysis for VOCs (related to reported receipt of TCE) and EP Toxicity lead (related to reported receipt of paint) was performed during two separate sampling events. During ground water sampling

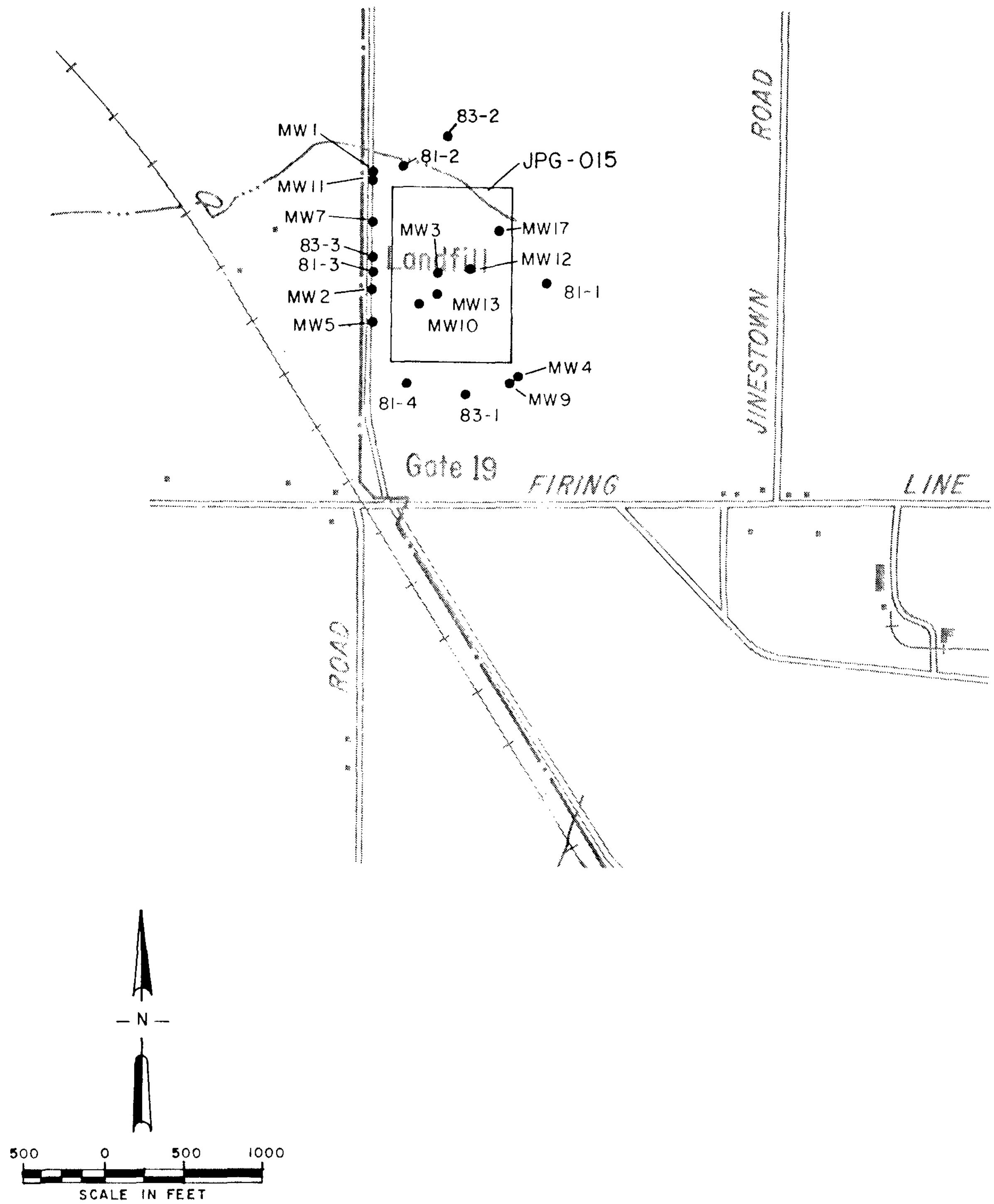

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FIGURE 12
JPG-015

and analysis conducted in July 1988, bis (2-ethylhexyl) phthalate was detected in ground water samples collected in wells monitoring the burning ground. This compound is a plasticizer, and may be attributed to plastics in the adjacent Gate 19 landfill, PVC well casings and bails, and/or laboratory contamination of the sample itself. All bis (2-ethylhexyl) phthalate concentrations were below detection limits, however, in all of the wells sampled in October 1988. Acetone, a volatile organic compound and commonly used solvent, was also detected in samples collected during the October 1988 sampling event from MW5. The concentrations detected were present in levels above that of the July 1988 sampling effort, where no detectable concentrations of acetone were found. No lead was detected in any of the ground water samples collected from the wells monitoring the Gate 19 landfill. Hydrogeological analysis indicates that the ground water in this area moves in a west-northwest direction at a velocity of 15 feet per year. Ground water monitoring has not shown evidence of off-site migration of contaminants.

3.5.2 Gate 19 Landfill - JPG-015

JPG-015 is a 12-acre active landfill, including an asbestos disposal area and waste pile (construction debris), of unknown depth (Figure 12). Disposal of construction debris and asbestos are in separate areas within the landfill. Construction debris mainly consists of concrete block, metal, wire, and a minor amount of wood debris and is deposited on the ground surface of the construction debris section of the landfill, which comprises as much as 10 acres of the total area. This area contains ash from an incinerator plus other non-combustible trash. Additionally, this landfill was reportedly used for dumping of red lead paint and methylene chloride/polyurethane residues. The asbestos landfill area is a shallow area where double-bagged asbestos is buried. The landfill has been in use from the 1960's to the present. The construction debris disposed at the Gate 19 Landfill is inert and has minimal potential to migrate. Asbestos, however, can cause serious respiratory ailments. The potential for exposure is from poor handling of the asbestos. However, only double-bagged (6 mil polyethylene bags) asbestos is accepted by the landfill prior to burial.

Between 1960 and 1980, this site reportedly received 1000 to 10,000 gallons of trichloroethylene (TCE) and paint. The reports of TCE and paint dumping indicate that a release to the environment may have occurred at this area. TCE can migrate into ground water under conditions of moderate to high permeability. The heavy metals in waste paints are not mobile, and bond to organic material in sands and clays unless the conditions are acidic. Potential contaminant release mechanisms include migration of contaminants through soils to ground water. Ground water in this area is

approximately 25 feet below the surface. The potential for contaminants, if present, to reach the ground water is moderate. Considering the amount of clay present in subsurface soils at the landfill, it does not appear that conditions of high permeability exist. The ground water flow direction is generally from the east to west, which could result in the migration of contaminated ground water from the installation, potentially contaminating private drinking water well users in the surrounding area.

In 1988, fourteen (14) ground water monitoring wells were installed under a remedial investigation to characterize the Gate 19 Landfill and the adjacent burning ground (JPG-014) (Figure 13). Analysis for VOCs (related to reported receipt of TCE) and EP Toxicity lead (related to reported receipt of paint) was performed during two separate sampling events. During ground water sampling conducted in July 1988, bis (2-ethylhexyl) phthalate was detected in ground water samples collected in wells monitoring the Gate 19 landfill. This compound is a plasticizer, and may be attributed to plastics in the Gate 19 landfill, PVC well casings and bails, and/or laboratory contamination of the sample itself. All bis (2-ethylhexyl) phthalate concentrations were below detection limits, however, in all of the wells sampled in October 1988. Acetone (27 ug/l) was detected in MW5 during the October 1988 sampling event, while bis (2-ethylhexyl) phthalate was not detected.

Hydrogeological analysis indicates that the ground water in this area moves toward the west-northwest at a velocity of 15 feet per year. The analytical results from the Remedial Investigation, in conjunction with previous studies, indicated that ground water contamination in the vicinity of the Gate 19 Landfill is insignificant or nonexistent. The downgradient monitoring wells, located along the installations's western perimeter, are placed such that any contaminant plume originating from the Gate 19 Landfill that might potentially migrate off-post would be detected. No such plume has been detected, but the wells installed at the landfill may not be adequate to properly define ground water quality, for several of them are dry, and do not produce samples for laboratory analysis.

3.6 Other Environmental Concerns

General areas of environmental concern were identified during Ebasco's Enhanced PA site visit conducted in November 1989. The specific concerns include PCB-containing oils, asbestos, underground storage tanks, surface water, ground water, radon gas, and lead paint. Locations where these concerns are applicable are not and should not necessarily be considered SWMUs. However, the potential for their release to the environment, resulting contamination, and potential toxicity must be addressed to completely characterize the areas requiring environmental evaluation which take place at JPG.

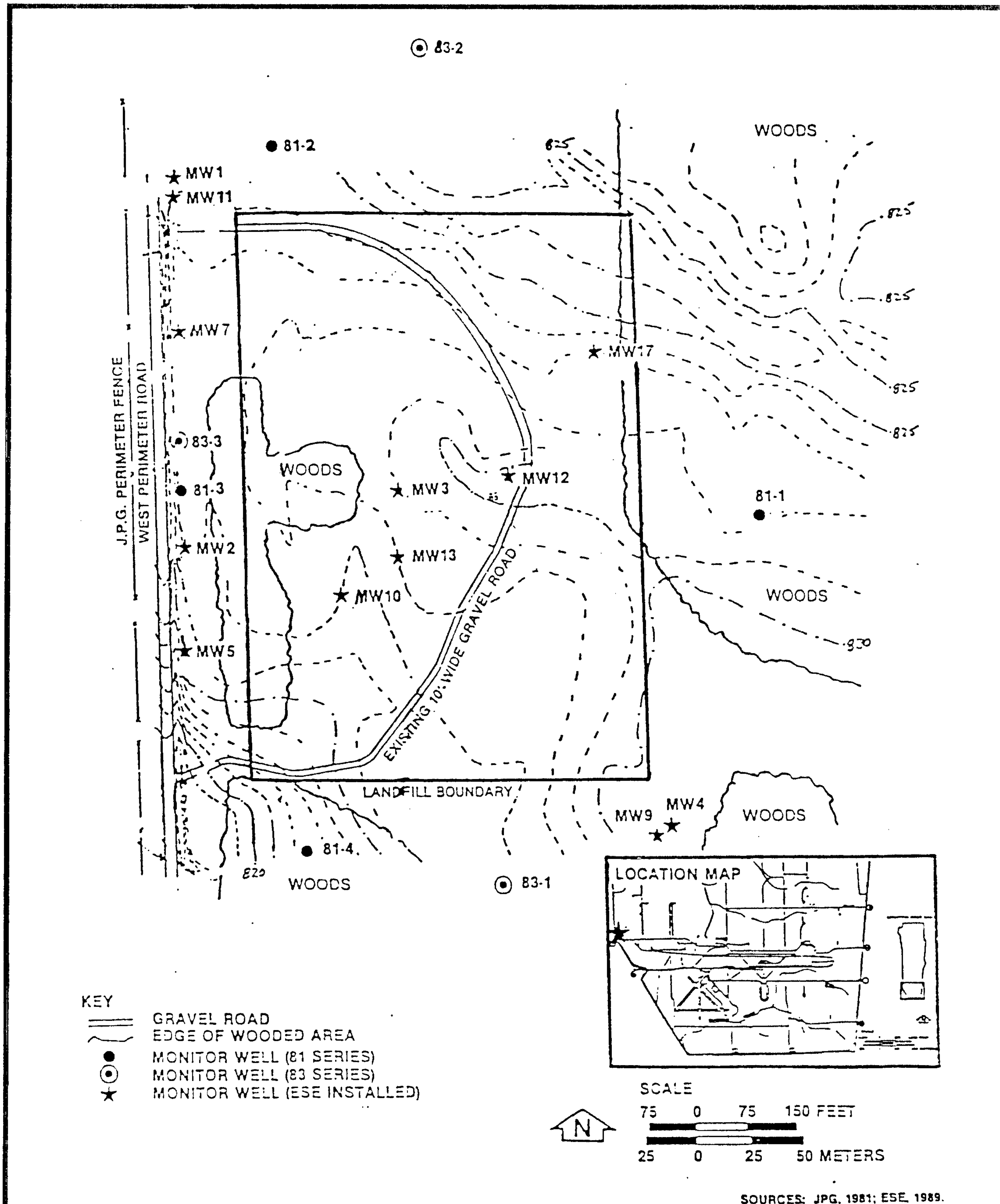

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FIGURE 13
Location of Gate 19 Landfill Ground Water Monitoring Wells

3.6.1 PCB Containing Oils

In January 1989, an inventory of all transformers (252) was conducted as part of a quarterly internal inspection (Appendix 6). The inspection did not indicate whether a release of PCB-contaminated liquids had occurred, although the conditions of all containers were defined as "good." It is unknown whether these transformers have ever leaked fluid. Potential PCB-contaminant release mechanisms include leaks from transformers onto shallow soils. If a release to the environment has occurred, investigation through the performance of sampling and analysis of the affected environmental media is necessary. Depending upon the levels of contamination found, a remediation effort would be required in accordance with 40 CFR Part 761. An abatement effort would require the excavation and treatment of contaminated soils in an incinerator, or landfilling according to waste concentration.

During the site visit, it was revealed that the electrical distribution system at JPG was going to be changed. This will require the replacement of all electrical devices, including transformers, capacitors and breakers that contain PCBs. Each of the transformers was sampled at the time of the inventory, and analysis indicated that seven (7) of the transformers contained levels of PCBs greater than 500 ppm. (During closure of JPG, the seven (7) transformers must be disposed of in accordance with TSCA, 40 CFR Part 761, and the regulations of the State of Indiana. The disposal method for the remaining 245 transformers will be determined by the PCB concentration ranges present in a given transformer. Concentration range (i.e., 0 to 50 ppm, or 50 to 500 ppm, etc.) classification is required prior to determining the appropriate disposal requirements). It is unclear how many small capacitors are present at JPG. Any capacitor containing greater than 500 ppm of PCBs must be disposed of in the same manner as PCB transformers.

Presently, transformers can be disposed of through incineration or drained of PCB-contaminated oil and disposed as empty in a chemical/hazardous waste landfill. Small capacitors could possibly be disposed of as municipal solid waste under approval of the Indiana DEM. The Indiana DEM, however, restricts the disposal of large quantities of small capacitors on a site-specific basis. If the total volume of small capacitors is found to be large, the DEM may require disposal in a chemically secure facility or incinerator.

3.6.2 Asbestos Removal Program

Asbestos containing materials are present in various construction materials of several of the JPG buildings. These construction materials include, but are not limited to, pipe insulation, roof

shingles, and siding. A preliminary survey estimated that the total length of pipe insulated with asbestos is approximately 197,000 linear feet. Asbestos shingles and siding account for an approximately additional 258,000 square feet. Currently, JPG utilizes the Gate 19 Landfill (JPG-015) as a permitted disposal site for double-bagged asbestos materials. Asbestos is a known carcinogen, and through the inhalation exposure pathway causes the human lung cancer forms of mesothelioma, asbestosis, or lymphomas. Asbestos presents the most significant potential for hazard when friable, or in a state that can be easily crumbled. Asbestos becomes friable as it degenerates on construction materials over time, as well as during removal/abatement activities. The abatement of asbestos containing materials usually consists of either physical removal or encapsulation.

The asbestos materials encountered during the enhanced preliminary assessment site visit were indicative of a significant amount of friable asbestos. The parties present during the site visit at the airport hangar visually observed asbestos containing lagging hanging from pipe insulation runs, and pipe runs where exposure to the natural elements of wind, heat, or water have and potentially continue to create a human health hazard. It is impossible to assess the magnitude of the potential for contaminant release through these pathways at this point in time. However, JPG should undertake remedial measures to prevent the release of any asbestos containing material which constitutes a human health hazard. JPG has current asbestos management procedures, which are followed for removal and handling of asbestos containing materials (Appendix 7). Base Closure would require the complete remediation of all asbestos which presents an airborne human health hazard.

3.6.3 Underground Storage Tanks

Currently, there are 54 underground storage tanks (USTs) located at various sites at JPG. The tanks were installed between 1941 and 1985, with capacities ranging from 300 and 25,000 gallons. The tanks are constructed of materials ranging from bare steel to coated steel. Many of the USTs are of unknown age and cannot be easily located. It appears, however, that each of the USTs is associated with a base building located south of the firing line and would not be found downrange. The contents of the USTs include No. 2 fuel oil, No. 2 diesel oil, leaded and unleaded gasoline and kerosene, and white gas. Due to the age of the majority of the USTs, it is possible that some leakage of tank contents into surrounding soils, and possibly ground water, has occurred. Therefore, JPG should undertake a program of tank testing or removal to ensure that all the USTs are in compliance with Federal, State, and local regulations. Descriptions of the USTs, and their general locations, are located in the tables presented in Appendix 8.

Under recently promulgated regulations for USTs, 40 CFR Parts 280 and 281, tank owner/operators must upgrade their tanks to include specific measures for the prevention, detection, and remediation of releases from these systems or perform tank closure. Specifically, leak detection, corrosion protection, and spill and overfill prevention systems must be installed over a 5-year phase in period based on the age of the tank. All tanks not in compliance with upgrading regulations must undergo closure. Closure can be performed by physical removal (and replacement, if desired) or abandonment in place. Removal of USTs involves the emptying of the tank, ensuring a vapor-free environment, removing the tank from the ground, and disposing of the scrap metal in an appropriate manner in accordance with all applicable regulations (API 1604). Abandonment in place involves the emptying of product, removal of residual sludge, rendering the tank vapor-free, and filling the tank with an inert solid such as sand or crushed rock. Utilizing either technology requires the performance of an extensive tank closure assessment to determine whether the tank leaked product during its active life, and to document the type and extent of contamination.

When and if contamination is determined, full site characterization is necessary to define the lateral and vertical extent of contamination, the presence of ground water contamination, and delineation of any contaminated ground water plumes migrating off-site. These findings must be addressed under a Corrective Action Plan, and propose appropriate methodology(ies) for the remediation of contamination. This action can result in a significant, complex, and costly undertaking on the part of JPG. The corrective actions usually consist of removal and disposal of contaminated soils, recovery of free product, and treatment of ground water through biological methods, air stripping, or carbon absorption followed by discharge. A program of UST compliance is the most logical approach to the management of the USTs at JPG, and could address each of the factors likely encountered for each of the tank scenarios.

3.6.4 Surface Water

Several creeks traverse Jefferson Proving Ground. The creeks include Otter Creek, Graham Creek, Little Graham Creek, Marble Creek, Big Creek, and Harberts Creek. The surrounding area is not frequently flooded.

The potential for contaminant release to surface waters on site is minimal; however, the nature and quality of the surface water is unknown. For example, streams flowing onto JPG have the potential to carry agricultural contaminants (fertilizers and pesticides) from near-by farms onto JPG. Surface water and sediments from both upstream and downstream have not been sampled.

3.6.5 Ground Water

The bedrock in the JPG area does not have a dependable water-bearing strata. Public/private utilities provide water service to practically all households in the small rural areas surrounding JPG. Nearly all of this water is pumped from the Madison well field which yields 8.3 MGD from the sand and alluvial aquifer of the Ohio River Valley. A number of private well users are located in the surrounding areas.

The private wells could be considered as potential off-site receptors if contaminants are released via ground water flow from JPG. Potential contaminants of concern include metals leachate from UXO, fuel/petroleum products from USTs (predominantly volatiles), and TNT/DNT. The regional flow appears to be in the south-southwest direction, but many surface and bedrock features could alter the flow direction. Currently, there are no ground water monitoring wells located along the perimeter of the JPG property, except in the Gate 19 landfill area, to characterize the quality of ground water as it is moves off-site.

3.6.6 Radon Gas

Radon gas is generated by the decay of uranium in the bedrock and/or other subsurface features (such as glacial till) prevalent in Indiana. Radon gas migrates toward the surface through subsurface joints, pores, and fissures, and enters structures through building foundations (most commonly detected in basements and first floor areas). The potential release mechanism for the gas is via air transport. Radon gas can potentially exist in any of the buildings at Jefferson Proving Ground. To date, radon gas surveys have not been conducted at any of the JPG facilities.

3.6.7 Lead Paint

Several of the buildings at JPG were reportedly painted with lead paint. Lead is hazardous to human health in small quantities when inhaled or ingested. The concern about the presence of lead in paint on facility structures is supported by the reports of red lead paint disposal at the Gate 19 Landfill and other areas. To date, no lead paint surveys have been conducted at any of the JPG facilities.

4.0 KNOWN AND SUSPECTED RELEASES

This section describes the potential hazards at JPG by identifying known and suspected releases to different media. The conclusions drawn from this section are based on data contained in published documents such as Technical Report A011, Remedial Investigation at Jefferson Proving Ground, Report No. 176, Installation Assessment of Jefferson Proving Ground, and other pertinent information obtained during the preliminary site visit.

4.1. Known Releases to Ground Water

The sources of known releases to ground water are: 1) Building 279; and 2) Gate 19 Landfill. A brief discussion of each of these sources follows.

4.1.1 Building 279 (JPG 029)

Solvent was disposed in a 3' X 3' X 2' cobble filled pit outside Building 279. In addition, solvents were reportedly spilled on the ground. Three monitoring wells were installed around Building 279. One (MW-15) was installed in the immediate vicinity of the disposal area, and two others (MW-14 and 16) down gradient of MW-15. Ground water samples from those wells were analyzed for base/neutral/acid (BNA) extractable compounds, lead and volatile organics compounds (VOCs). Only the sample from MW-15 contained VOCs. The concentration of 1,1-dichloroethene, 1,1,1-trichloroethane, and trichloroethylene exceeded Federal Drinking Water Standards. No VOCs were detected in the samples from wells downgradient (MW-14 and 16). This indicates that migration of contaminants has not yet occurred.

4.1.2 Gate 19 Landfill

The most significant materials disposed of at this landfill are 1,000-10,000 gallons of waste trichloroethylene from 1960 through 1980. Seven monitoring wells were installed from 1981-83 to determine if contaminants have migrated from the landfill to the ground water in the immediate vicinity. Twelve additional monitoring wells were installed at various depths in 1988 to quantify water quality differences with depth. Analytical results of sampling performed in October, 1988, indicate that acetone (27 ug/l) was present in ground water. The result of earlier sampling (July, 1988) showed the presence of bis(2-ethylhexyl)phthalate found commonly in plastics. These could have came from the PVC piping in the monitoring wells or through laboratory

contamination.There is no evidence to suggest contaminants have migrated off-site. Given the low hydraulic conductivity of the soil (Glacial Till, 1.6 x 10^{-3} ft/min) and the slow volatilization of VOCs from the soil (vadose zone), long term monitoring will have to continue to determine the impact of any contaminant migration on ground water quality.

4.2 Suspected Releases to Ground water

The sources of suspected releases to ground water include: (1) UXO Contamination (including the Gator Mine Testing Area, JPG-013 (Munitions Demilitarization), JPG-017 (Landfill), and JPG-018 (Abandoned Well Disposal)) ; (2) Burn Areas (including that South of the Firing Line and JPG-014 (Gate 19 Burning Ground)); 3) JPG-009 (Red Lead Disposal Area); 4) Solvent Disposal (including JPG-027 (Solvent Pit-Building 602) and JPG-028 (Solvent Pit-Building 617); 5) Solid waste (including JPG-024 (Landfill), JPG-025 (Landfill), and JPG-026 (Landfill); 6) Depleted Uranium Area; and 7) Underground Storage Tanks. A brief discussion of each of these sources follows.

4.2.1 Cracked UXO

Unexploded projectiles have been identified both north and south of the firing line. Corrosion or physical damage could have released hazardous materials from the projectiles into the ground water via leaching from surrounding soils. These could then be transported off site. Additionally, the DU impact area has been used exclusively for testing DU penetrators and systems since the beginning of the program in 1983. However, prior to 1983, conventional munitions were also tested in the area. The potential for ground water contamination with metals, TNT, and other explosives should also be investigated. The potential for such contamination through corrosion or cracking of test specimens and subsequent transport of contaminants is not limited to ground water in the vicinity of the DU impact area alone, but extends to other areas as well, since UXO has been identified or is known to exist throughout the facility. A ground water monitoring program is needed to determine whether contamination from UXO and if so, to what extent.

4.2.2 Burn Areas

Leaching of residue on the ground surface (south of the firing line) through soils to ground water is a potential release mechanism. The components of the black residue are unknown, and there are no additional data concerning this area. The Gate 19 Burning Ground was utilized for the open burning of waste POL. It was also reportedly the site of trichloroethane and lead paint dumping. Although this area is no longer utilized for burning of any type of material, a release to the soils and leachate to the ground water could have occurred. Ground water monitoring wells installed at this area have not detected contamination.

4.2.3 Red Lead Disposal Area

These areas were reportedly used for the dumping of red lead filler for inert rounds and paint. Leaching of lead through soils to shallow ground water is a potential release mechanism.

4.2.4 Solvent Disposal

Waste trichloroethane and trichloroethylene were dumped in small quantities on the 3' X 3' X 2' pit outside Building 602 from 1950-70. This practice has since stopped. Currently, there are no monitoring wells nearby to obtain samples for analyses. Waste solvents such as trichloroethane and trichloroethylene dumped from 1970-78 over a 3' x 3' x 2' pit outside Building 617. This practice has stopped since 1978. Soil gas studies conducted in 1987 at both sites showed no detectable concentrations of VOCs. Soil sample analyses, however, indicated contamination of soils with eleven compounds.

4.2.5 Solid Waste

JPG-024 (Landfill), JPG-025 (Landfill), and JPG-026 (Landfill) were once utilized for the disposal of solid waste which included putrescibles, paper, construction debris, and possibly ordnance related materials. The potential migration of contaminants of concern is minimal, however, no ground water monitoring wells have been installed at these areas to characterize the quality of the ground water.

4.2.6 Depleted Uranium Area

JPG tests a number of Depleted Uranium Penetrators for penetrator accuracy. This testing program started in 1983 and is implemented under controlled conditions. Depleted Uranium consists mostly of U^{238}, an isotope of uranium that is not radioactive, and about 0.01% of U^{235}, a radioactive isotope. Soft targets (as opposed to hard targets) are used in the DU impact area to minimize formation of radioactive aerosols from impact. Twelve monitoring wells have been installed around this area and monitored for radioactivity. JPG also implements a soil, surface water, and sediment sampling program to monitor radioactivity in soil.

Presently, the ground water in the vicinity is not contaminated with radioactivity beyond regulated levels. However, the potential for such contamination in the future cannot be reduced unless the source is removed.

4.2.7 Leaking USTs

The presence of USTs at the facility create the potential for soil and ground water contamination by fuel products, and other stored materials. The potential for such contamination is increased due to the age of the USTs, and the possibility of product spills and overfills which may have occurred during the active life of each of the tanks. Currently, a UST program is underway at JPG to remove the USTs. It is unknown whether product leaks from USTs have occurred, or if any leakage has been discovered during tank closure activities. In accordance with Federal regulations for USTs (40 CFR Part 281), JPG must address the potential for this type of contamination at the time of tank closure.

4.3 Releases to Surface Waters

There are no confirmed or known releases to surface waters at JPG. Potential sources of suspected release to surface waters include explosives and heavy metals from cracked UXO, depleted uranium from the DU Impact Area, effluent from the Sewage Treatment Plant (JPG-003), lead from the red lead disposal areas, heavy metals, solids, and possibly ordnance materials from burn areas, and sulfur from the sulfur disposal area. Except for the NPDES and DU area monitoring, JPG does not have a formal surface water monitoring program.

4.3.1 Suspected Releases from Cracked UXO

A number of creeks run through or close to impact areas. Unexploded projectiles could have landed and fallen under water. Corrosion or physical damage could have released hazardous materials from the projectiles into surface water bodies on site. These could then be transported off site. The extent of such suspected contamination on or off-site is not known and should be investigated through a surface water monitoring program.

4.3.2 Suspected Releases from Depleted Uranium

Big Creek runs through the Depleted Uranium Impact Area, and the nearby surface waters should be monitored for radioactive releases. To date, ground water monitoring at this location has not detected the presence of contamination.

4.3.3 Suspected Releases from the Sewage Treatment Plant Effluent

The Sewage Treatment Plant (STP) effluent has the potential to release contaminants to surface waters. Cyanides and bleaches, however, are no longer present in the waste stream sent to the Sewage Treatment Plant. Except for occasional violations for the control of suspended solids, the STP has had no difficulty in complying with NPDES discharge requirements. Occasional violations have been corrected through the removal of old leaking clay pipes and the installation of new PVC pipes. Consequently, no contamination of surface water bodies is expected from the STP effluent, particularly with the improvement of the sewer lines.

4.3.4 Suspected Releases from Red Lead Disposal Areas

Because all areas where red lead were placed are not well defined, it is possible that there are disposal areas located near streams or drainage ways. If this is the case, then lead could migrate through soils into surface waters (via shallow ground water through flow), or the soils in the area could erode, thereby allowing the lead to be washed into surface waters.

4.3.5 Suspected Releases from Burn Areas

Residues left on the ground surface from open burning of materials may be easily transported to surface waters during rainfall events,

both through overland flow and shallow through flow of rain water. The contaminants may be heavy metals, suspended and dissolved solids, or explosives and propellants.

4.3.6 Suspected Releases from the Sulfur Disposal Area

Because the sulfur disposal area is located on the banks of a stream or drainage way, there is a direct pathway for these materials to be transported into the stream, from both runoff of precipitation and stream scouring during increased flow.

4.4 Releases to Soil

The known sources of soil contamination at JPG include: 1) JPG-030 (Fire Training Pit); 2) the Sulfur Disposal Area South of the Firing Line; 3) JPG-022 (Open Burning Area); and 4) Solvent Disposal (including JPG-027 (Solvent Pit-Building 602), JPG-028 (Solvent Pit-Building 617), and JPG-029 (Solvent Pit-Building 279)).

4.4.1 Known Releases from the Fire Training Pit

A 19 sq meter (200 sq ft) area, approximately 0.7 meter (2 ft) deep was used as a test pit for practicing fire fighting. The pit was not lined and materials burned consisted of wood, solvents and other unknown materials. This practice has been discontinued. The soil in the area of the pit could contain unburnt residue. No soil sampling has been done in this area.

4.4.2 Known Releases from Sulfur Disposal Area

This area, located south of the new incinerator, was used for the disposal of a yellow, sulfur-like material. The contaminants of concern are unknown. The surface soils at this site contained yellow powder and yellow material in a waxy substance. No soil sampling has been done in this area.

4.4.3 Known Releases from JPG-022 (Open Burning Area)

Currently, open burning is conducted only at one location, JPG-022. The burning is done in four (4) burning trays, and the residual ash is subsequently tested for EP toxicity prior to

disposal. The current management of open burning is environmentally sound. Previously at this location, however, open burning took place on the ground surface. Consequently, the incomplete combustion of materials allowed residual ash and heavy metals to be released to the soils at this site.

4.4.4 Known Releases from Solvent Disposal

Small quantities of trichloroethane and trichloroethylene were dumped into the ground outside Building 602. The extent of contamination appears to be limited to an area covering approximately the length of the building (to the north) and about 3 ft. wide. A soil gas survey was conducted to a depth of 5 ft. during Remedial Investigation (1989). Soil samples collected up to a depth of about 3 ft. were analyzed and found to contain a total of about 3.5 ug/g (ppm) of Volatile Organic Compounds (VOCs).

Disposal of trichloroethene and trichloroethylene was also conducted outside Building 617 over an area of approximately 9 sq. feet with a 4 ft. depth. Soil samples analyzed during Remedial Investigation (Technical Report A011, 1988) showed total VOC contamination greater than 4.3 ug/g (ppm). Benzene and toluene were also detected in these samples. These could have come from spills of No. 2 fuel oil stored in two Underground Storage Tanks (USTs) on site. These tanks have been removed. The lateral or vertical extent of organic contamination is unknown. Since no water quality data currently exists for the ground water underlying this building, the soil in the area where solvent was dumped should be considered as another potential source for ground water contamination.

The soil surrounding Building 279 is a known source of VOC contamination from solvent dumping in the past. Soil samples analyzed show a total of 0.1 ug/g (ppm) VOCs consisting of hexane, trichloroethane, and trichlorofluoromethane (Technical Report A011). Ground water samples collected and analyzed show that the majority of the contaminants have migrated from the soil to the ground water in the immediate vicinity of the building.

4.5 Suspected Releases to Soil

Potential sources for suspected releases to soils include:

1) Burn Areas (including JPG-004 (Burning Ground), the Burn Area S. of the Firing Line, JPG-006 (Explosives Burning Ground), the Gator Mine Burn Area, JPG-014 (Gate 19 Burn Area), and JPG-022 (Open Burning Trays);

2) Temporary Storage Areas (including JPG-036 (Building 305), JPG-031 (Building 105), JPG-034 (Building 227), and JPG-035 (Building 186));

3) Munitions Demilitarization (including JPG-013, JPG-023 (Open Detonation Area), and the Gator Mine Testing Area);

4) Solid Waste (including the landfills at JPG-024, JPG-025, JPG-026);

5) Ordnance Disposal (including JPG-016 (Ordnance Disposal Site) and JPG-017 (Landfill));

6) Photographic and Laboratory Chemicals (including JPG-002 (Water Quality Lab), JPG-005 (Landfill), and JPG-010 (Photographic Lab));

7) JPG-001 (Old Incinerator);

8) JPG-003 (Sewage Treatment Plant);

9) UXO Contamination, including the Munitions Test Pond (JPG-019) and the Macadam Lined Test Pond (JPG-020);

10) JPG-009 (Red Lead Disposal Area);

11) JPG-012 (Indoor Range);

12) Depleted Uranium Impact Area;

13) Underground Storage Tanks; and

14) JPG-015 (Gate 19 Landfill).

4.5.1 Burn Areas

JPG has conducted open burning of defective test materials, UXO, explosive wastes and explosive residues at several locations within the facility since the 1950s. The locations of these areas are described in Section 3.0. Currently, open burning is conducted only at two locations south and one location north of the firing line. The current management of open burning is assumed to be environmentally sound, but there is no formal air quality monitoring program in place at JPG. However, ash from burnings prior to RCRA regulations could have contained heavy metals and materials from incomplete combustion. The environmental impact of such residues should be minimal considering the high burning temperatures and the small quantities of the resulting ash produced. However, this cannot be confirmed without a field investigation. No distressed vegetation was observed around any of the burning areas.

4.5.2 Temporary Storage Areas

Four (4) separate buildings at JPG are utilized for the temporary storage of hazardous waste materials such as spent solvent, PCB-contaminated oils, ash residues, asbestos, hydraulic fluids, and scrap propellant prior to pick-up by DRMO. All of the wastes are properly containerized and handled, however, contamination of soils is possible in the event of a major spill event. The interior storage locations did not appear to be visually contaminated, and no distressed vegetation was observed at any of the outdoor storage areas. No sampling has been conducted at these areas.

4.5.3 Munitions Demilitarization

The demilitarization of munitions at JPG reportedly occurred at JPG-013, of which the size and dates of use are unknown. Repeated site visits have been unable to locate this site. Previous studies have indicated that this area is a potentially hazardous waste disposal site, with the suspected contaminants including heavy metals, DNT, and TNT. The site is no longer used. Presently, demilitarization of munitions occurs by open detonation at JPG-023. This site operates under RCRA Interim Status for open and above-ground detonation of munitions. Leaching of metals, propellants, and explosives to surrounding soils is possible, however, no evidence of a release exists at this location and debris is minimal and limited to inert metal fragments and projectiles.

4.5.4 Solid Waste Disposal

Solid wastes were disposed at the landfills designated as JPG-024, JPG-025, and JPG-026. The wastes included putrescibles, paper, construction debris, and other non-toxic types of waste. Each of the landfills is abandoned and of unknown depth. The buried wastes have a minimal potential for migration into the surrounding soils. No evidence of leachate or other releases exists at these areas.

4.5.5 Ordnance Disposal

JPG-016 and JPG-017 were once utilized for the disposal of munitions-related components, including chemical explosives and inert munitions, respectively. Buried wastes and water-filled pits containing ordnance make up these sites. It is unknown whether the shells are explosive or not. Metals, TNT, and DNT have the ability to migrate into the surrounding soils. No evidence of a release was observed at either disposal site.

4.5.6 Photographic and Laboratory Chemicals

Photographic and laboratory chemicals are present at the Water Quality Laboratory (JPG-002), a 1-acre landfill used for dumping of film refuse from the Photographic Laboratory (JPG-005), and the Photographic Laboratory (JPG-010) itself.

The Water Quality Laboratory has been operational at the STP since the 1960s. Waste chemicals required for laboratory analysis (e.g., flow, pH, BOD, suspended solids, fecal coliform, and residual chlorine) are generated in minimal quantities. Recent sewer improvement programs and Standard Operating Procedures for chemical waste handling prevent contaminant release. No soil sampling has been performed at JPG-002.

JPG-005 is a 1-acre landfill of unknown depth comprised of small, filled-in trenches. Film refuse, containing minor amounts of silver (Ag), was disposed at this site. A potential migration pathway by leaching of Ag through surrounding soils exists at this area. No geophysical screening or soil sampling to the base of this landfill has been conducted.

The Photographic Laboratory develops and prints black and white and color film for JPG activities. A silver recovery unit operates at this site. Waste toner (containing minor amounts of Ag) is diluted prior to discharge to the sanitary sewer system. The waste toner and developer drained into the sewer system has little migration potential. The potential for migration into the ground is minimal. No evidence of a release to the environment was observed at this location.

4.5.7 JPG-001 (Old Incinerator)

The old incinerator was used to burn paper products, including debris and small ammunition from the installation. The unit is not active, and there are no current migration pathways. When operational, particulate matter may have become suspended in the air and settled on surrounding ground surfaces. No evidence of release to the ground surface was observed; however, no soil sampling has been conducted around the building.

4.5.8 JPG-003 (Sewage Treatment Plant)

The Sewage Treatment Plant (STP) effluent undergoes primary and secondary treatment, which includes drying of solids on a sludge drying bed. The dried sludge is subsequently sampled prior to its disposal at an off-site sanitary landfill. Cyanides and bleaches are no longer present in the waste stream sent to the STP. To

date, the analysis of sludge material has not indicated contamination from silver. Soil sampling of sludgebeds has not been performed.

4.5.9 UXO Contamination

The potential for soils contamination with metals, TNT, and other explosives should be investigated at all areas affected. The potential for such contamination through corrosion or cracking of test specimens and subsequent transport of contaminants is not limited to the soils in the vicinity of the designated impact areas alone, but extends to other areas as well since UXO have been identified and/or are known to exist throughout the facility.

4.5.10 JPG-009 (Red Lead Disposal Areas)

These sites were reportedly used for the dumping of red lead paint. Leaching of lead contamination through soils into ground water is a potential release mechanism. Sampling of soils and ground water for lead has not been performed in these areas.

4.5.11 JPG-012 (Indoor Range)

The indoor range was utilized to test small arms for training until the early 1980s. The area was closed due to concern regarding interior contamination from lead oxides and lead dust derived from the firing of bullets used at the range. The potential migration pathways include the presence of lead dust inside the building and in soils surrounding the building. No sampling has been conducted to date.

4.5.12 Depleted Uranium Impact Area

JPG tests a number of depleted uranium penetrators for penetrator accuracy. This testing program started in 1983 and is implemented under controlled conditions. Depleted Uranium consists mostly of U^{238}, an isotope of uranium that is not radioactive, and about 0.01% of U^{235}, the radioactive isotope. Soft targets (as opposed to hard targets) are used in the DU impact area to minimize formation of radioactive aerosols from impact. JPG implements a soil sampling program to monitor radioactivity in soil. Presently, the soils in the vicinity are not contaminated with radioactivity beyond regulated levels. However, the potential for such contamination in the future cannot be reduced unless the source is removed.

4.5.13 Underground Storage Tanks

The presence of USTs at the facility create the potential for soil contamination by fuel products, and other stored materials. The potential for such contamination is increased due to the age of the USTs, and the possibility of product spills and overfills which may have occurred during the active life of each of the tanks. Currently, a UST program is underway at JPG to remove the USTs. In accordance with Federal regulations for USTs (40 CFR Part 281), JPG must address the potential for this type of contamination at the time of tank closure.

4.5.14 Gate 19 Landfill

This landfill, located north of the firing line, has been used to dispose of ashes from the incinerators and the open burning trays (JPG-022). Materials incinerated at the old incinerator (Building 185) included primarily paper products, waste oils, debris, and possibly some small arms ammunition. The old incinerator is no longer used. A new incinerator located in Building 333 burns paper products, debris, and chemical components from inert munitions. The Building 333 ash is not analyzed prior to disposal at the landfill. Residue ash from the open burning is analyzed for EP Toxicity, and is disposed of at the landfill if it is not a RCRA hazardous waste. If it is a hazardous waste, it is disposed of off post as a hazardous waste. EP toxicity tests were not conducted prior to RCRA regulations. Since the landfill is not lined, the ash previously disposed should be considered a potential source of contamination from organic residue and metals.

According to the Installation Assessment (Report No. 176), some insecticide and pesticide containers had been disposed of without rinsing. Therefore, the soil could be potentially contaminated with pesticide/herbicide residues.

About 1,000 - 10,000 gallons of waste TCE was reportedly disposed of between 1960-1980 (RI, Technical Report A011). These solvents may have been disposed of directly or in containers. In either case, the potential for soil contamination cannot be ruled out.

Other materials disposed of are asbestos and general construction and/or demolition debris. Waste paints containing red lead and polyurethane compounds (used as filler material in inert munitions) are suspected to have been disposed in the landfill. This could not be confirmed through review of existing documents, but was confirmed through interviews with retired JPG personnel.

Long term ground water monitoring should be continued to study the migration of contaminants from the soil through storm water infiltration and natural ground water movement.

4.6 Known Releases to Air

There have been no analytically documented releases of wastes to air at JPG, but releases to air must have occurred at the incinerators (JPG-001, 011), the burning grounds (JPG-004, 006, 014, 022, 023, and the Gator mine burn area), the fire training pit, and during the occasional forest fires.

Open burning is considered an acceptable way to dispose of explosives, explosive residues, explosive wastes, and UXO. Typically, only small quantities of materials are burned in batches under controlled conditions. Materials released could include CO, CO_2, oxides of nitrogen, phosphorous, and particulates. While the air quality impact that the standard operating procedures followed today appears to be minimal, it is impossible to assess the impact that past practices, such as open burning of TCE and waste oils, had on air quality.

Occasional forest fires have been reported at JPG. Releases from forest fires consist primarily of particulates, CO, CO_2, and some oxides of nitrogen. Considering the infrequency of their occurrence, forest fires will have minimal impact on air quality.

4.7 Suspected Releases to Air

JPG does not have a formal program to monitor air quality at the facility. Potential sources of air pollution include releases of asbestos fibers from friable asbestos materials, open burning, and open detonation, operation of the incinerator, practice drills at the Fire Training Pit, and forest fires.

JPG has been in operation since 1941. Many of the buildings are old and contain asbestos insulation in the walls and ceiling. Old process pipe lines and boiler insulation typically contain asbestos lagging. Asbestos has been and is currently disposed of in the Gate 19 landfill. JPG has a permit for such disposal. JPG also has an asbestos removal program. The asbestos encountered at JPG was indicative of a significant amount of friable asbestos. A brief visual inspection noted that pipe lagging was exposed to the natural elements. This occurrence potentially creates a source of air pollution. Friable asbestos is easily suspended and it is impossible to assess the magnitude of the potential for contaminant release to the air. An on-going asbestos removal program is in place to remove all asbestos-containing materials. No information is currently available to assess the impact of potential or past asbestos releases on air quality at JPG.

5.0 SUMMARY AND CONCLUSIONS

The enhanced preliminary assessment conducted by Ebasco Environmental, through the Argonne National Laboratory, at the United States Government property known as Jefferson Proving Ground, in Madison, Indiana was conducted in order to characterize the environmental impacts of past and current actions at the property. The primary objective of the enhanced preliminary assessment is to adequately characterize Jefferson Proving Ground to determine the need for further investigative efforts. Continued consideration or elimination from further action/study was based upon the characterization of site activities, determination of the quantity of hazardous substances present, and evaluation of the potential pathways for contaminant migration which would affect public health and the environment. As such, the following subsections identify areas which should continue to be considered under the closure plans currently being developed for JPG, and those areas which can be eliminated from further concern (except for the performance of general surveys, or updates of previous surveys, for radon, asbestos, and PCBs as required for release).

5.1 Summary and Conclusions Regarding the Area South of the Firing Line (West Side)

Several of the buildings in this area must be assessed for the presence of contamination in the soils surrounding the buildings, and of the interior surfaces (i.e. walls, floors, drains, and HVAC systems).

The soils at the burning areas (JPG-004, 030, and the area south of the new incinerator), may be contaminated with heavy metals, solvents, and/or POL products. As such, each of these areas may represent sources of soil contamination, which may, if undetected and unremediated, migrate into local surface and ground waters.

The landfill located in this area, JPG-005, may represent a source of contamination by silver, lead, and solvents. The limits of, and the specific wastes deposited in this landfill have not been determined. In order to fully assess the impact that this landfill has had and may have in the future, the limits of the landfill must be delineated, and soils must be analyzed for contaminants.

While the limits of the suspected sulfur disposal area are easily determined, the actual constituents in this disposal area have not been determined. Because it is on the banks of a stream, sediment and surface waters may have been contaminated.

The sewage treatment plant has operated within compliance of its NPDES permit, with the exception of several violations of suspended solids. This problem was addressed by a system repair and upgrade,

which replaced clay sewer pipe which was in poor repair, with new PVC pipe. To date, samples of the sludge from the drying bed have not yielded silver concentrations above EP Toxicity limits for non-hazardous wastes. It is unknown if releases from the STP have affected the flora and fauna of Harberts Creek, because no sampling of sediment or surface waters down stream from the STP has been performed. Because the STP has operated in compliance with the NPDES permit, except for past occasional violations of suspended solids, it is not expected that the plant effluent has had a detrimental effect on Harberts Creek.

This area may contain significant amounts of unexploded ordnance; this may well represent the most acute environmental problem associated with the area south of the firing line, due to both the physical and chemical hazards.

5.2 Summary and Conclusions Regarding the Area South of the Firing Line (East Side)

The burn areas in this portion of JPG, like those mentioned above, may be sources of contamination, for these areas are still periodically used. JPG-022, the thermal treatment area, now uses steel pans to burn excess propellants, and residuals are collected, sampled and disposed, depending on laboratory results. Previously, these pans were not used, and burning was done directly on the ground. As such, the soils in this area may be contaminated with heavy metals, and explosive and propellant residues. The burn area north of the Gator Mine Testing area is used for burning of debris which comes from the destruction of plywood sandwiches used for vehicle simulation in the mine tests. This debris is burned directly on the ground. As such, the soils in this area may be contaminated by metals, burned plastics, etc. Because both of these areas are still periodically used, air quality during the burns should be determined.

Areas where munitions have been tested, including the Gator Mine Testing Area and the rocket testing area, may be sources of contamination by heavy metals and explosives residues. In addition, there is the possibility that UXO exists in some portions of this area of JPG. The UXO, in addition to the metals and chemical hazards, may represent the most serious concern in this portion of JPG because of the explosion hazard.

5.3 Summary and Conclusions Regarding the Firing Line Area

Several buildings located in the area near the firing line must be assessed for the presence of contaminants by sampling interior surfaces, HVAC systems, and drains, as well as soils and ground water near the buildings.

Limited soil investigations around Buildings 602, 617, and 279 showed no evidence of widespread organic contamination. The potential for migration of contaminants through ground water transport at buildings 602 and 617 is unknown. Also, the potential for ground water transport of waste solvents disposed of at Building 279 is not well defined. In order to make informed decisions regarding the disposition of these areas, information on the soils and ground water must be obtained. Additionally, air in the indoor range should be sampled for the presence of lead.

The area for munitions demilitarization (JPG-013) must be properly located so that it may be assessed. This area may be a source of contamination by heavy metals and explosive residues, and may contain UXO. Any UXO which may be located here may also represent an extreme physical hazard, as does the UXO located in the area south of the firing line.

The red lead disposal area(s) are locations where lead oxides and lead based paint residues were disposed. The lead was allegedly placed between the railroad tracks behind buildings 202, 148, and 211, as well as the in JPG-005, and the Gate 19 landfill. The soils, surface waters, and ground water in these areas should be sampled and analyzed for lead.

5.4 Summary and Conclusions Regarding the Area North of the Firing Line

As with the area south of the firing line, the greatest hazard associated with the area north of the firing line, is UXO. While the hazard of chemical contamination may exist, the explosion hazard associated with this area most certainly exists. It is estimated that between 1.5 and 2 million rounds of unexploded ordnance may exist in the area north of the firing line.

Virtually the entire area north of the firing line is potentially contaminated with heavy metals and explosive residues, in addition to the UXO. There is insufficient data to assess the extent of on-site ground water contamination from UXO. Also, there is no information currently available on the ability of these contaminants to be transported to surface or ground waters off-site. Consequently, the potential for exposure to contaminants through ground water cannot be reliably assessed without additional field investigation.

A number of creeks run through the JPG, generally from east to west. Many of them run through the impact areas and are susceptible to direct contamination. Occasional fish kills have been mentioned in the records, but no surface water monitoring program has been established at JPG. Should the facility be released for unrestricted use, humans may be exposed to creeks and other surface water bodies (e.g., Old Timber Lake in the northeast part of the site). Therefore, these water bodies should be sampled during field investigations to determine if they are contaminated.

There are no signs of distressed vegetation at JPG, except in areas where defoliants were applied to keep the impact areas clear. Currently, there is no data available to determine if residual pesticides or herbicides in the soil could pose a hazard to human health through dermal contact or ingestion/inhalation of the soil.

The three landfills, along with the ordnance disposal sites located in the northern part of the facility must be properly located in order to fully assess their environmental impacts. The exact locations and limits of the buried wastes must be determined. The soils, surface and ground waters must be analyzed for the presence of contaminants.

The depleted uranium area is a source of uranium (heavy metal) and low level radioactive contamination. The potential contaminant release mechanism is the migration of uranium and radioactive decay products through the soil into surface and ground waters, and also may enter the biotic system. Uranium has not been detected in surface or ground waters. The DU penetrators should be located. A radioactive survey, tissue sampling, and surface and ground water sampling should continue.

Inadvertent forest fires occasionally occur north of the firing line due to the detonation of a HE or white phosphorous round, which in turn ignites brush, grasses, and trees. Because of this, there is a release of particulates to the atmosphere. This is not a major environmental concern, for the JPG fire department now conducts controlled burns, and maintains fire breaks which limit the extent of any forest fire.

5.5 Summary and Conclusions Regarding the Gate 19 Area

Although a limited ground water investigation has been conducted at Gate 19 landfill, no formal subsurface water quality monitoring program has been established for the JPG facility. Based on limited investigation, local ground water flow in this area appears to be in the west-southwest direction. Analytical results have shown limited organic contamination of the ground water in the vicinity of Gate 19 Landfill and the burning ground south of the landfill. The analytes found in the ground water were acetone and

bis (2-ethylhexyl) phthalate, and may be due to laboratory contamination and leaching from PVC well casing, respectively.

The wells installed at the landfill may not be adequate to properly define ground water quality, for several of them are dry, and do not produce samples for laboratory analysis. All ground water monitoring wells located at JPG should be re-sampled.

5.6 Summary and Conclusions Regarding Other Environmental Concerns

Jefferson Proving Ground has programs in place to evaluate and control asbestos, PCB containing oils, and underground storage tanks. These programs include proper training of personnel, as well as proper standard operating procedures. These programs appear to be acceptable, and should be continued.

There is no comprehensive program which assesses ground or surface water quality at JPG; these programs should be developed and implemented.

A Radon survey should be conducted at JPG. According to Army protocol, if hospitals and residences are surveyed, and radon is not found, the remaining buildings on the post are not required to be tested.

6.0 RECOMMENDATIONS

Based on the conclusions drawn in Section 5.0, recommendations for site characterization and further actions necessary for site closure and excessing of property were developed. Characterization of site activities, the quantity of hazardous substances present, and the potential pathways for contaminant migration which would affect public health and the environment were the primary considerations upon which the recommendations were based. The methods considered for site characterization included the performance of the following investigative activities: soil gas surveys; geophysical screening; soil sampling; surface water sampling; re-sampling of existing ground water monitoring wells; installation of additional ground water monitoring wells; and ground water sampling; etc. Additionally, activities required for the release of specific areas of JPG were considered, and included the following types of actions: lab-packing of chemicals; general surveys for radon and asbestos, and proper disposal of chemical wastes stored in 55-gallon drums, general housekeeping, etc.

The following sections, along with Table 2, summarize the recommendations for site characterization and further actions necessary for site closure and release of each of the solid waste management units (SWMUs), areas requiring environmental evaluation (AREEs), and all other facility property.

6.1 Site Characterization

Methods for site characterization were developed to further address the SWMUs and AREEs requiring additional consideration.

6.1.1 Recommendations for the Area South of the Firing Line (West Side)

Because particulate precipitation, ash spillage, and fuel oil spillage may have occurred at the incinerators (Buildings 185 and 333; JPG-001 and 011 respectively), soil sampling around the building is recommended.

Soil sampling around the buildings, wipe samples of HVAC systems and drains and chip sampling is recommended in the water quality laboratory (JPG-002).

Soil sampling is also recommended at the sewage treatment plant, JPG-003, in order to determine if spillage, leakage, or other contamination of the soil has occurred at the treatment plant, or the sludge drying beds.

In order to determine if subsurface contamination exists at JPG-004 (Explosives Burning Ground) soil sampling is recommended.

At JPG-005 (Landfill), it is recommended that a geophysical survey be conducted in order to define the areal and vertical extent of the landfill. Soil sampling to the base of the landfill is also recommended.

The two wood piles (JPG-007 and 008) are located on the airport runway. No sampling or further action is recommended.

It is recommended that soil sampling and analysis be conducted at JPG-030 (Fire Training Pit) to determine if contamination from waste POL and fuel products has occurred.

At Building 305 (JPG-036, Temporary Storage) chip and wipe sampling of hard surfaces, and soil sampling around the building, to determine if leaks from storage containers occurred is recommended.

It is recommended that areas south of the firing line contaminated with UXO be delineated, and soil sampling be conducted to determine if contamination of the soils with metals, TNT, or DNT has occurred.

Soil, surface water, and sediment samples near the possible yellow sulfur area must be collected and analyzed to determine whether additional remedial action is necessary.

The soils and surface water should be sampled in the vicinity of the burn area located south of the new incinerator. An effort should be made to determine what may have been burned at this site.

6.1.2 Recommendations for the Area South of the Firing Line (East Side)

It is recommended that soil sampling underneath the burning trays, and within the perimeter of the graded burning grounds, at JPG-022, the Open Burning Area, be conducted to determine if contaminants generated by burning activities are contained in the soils.

The UXO contamination south of the firing line should be located, as recommended above for the West side. Soil sampling should be conducted in order to determine if contamination of the soils with metals, TNT, or DNT has occurred.

Removal of ordnance materials and sampling of soil, surface and ground water is required at the Gator Mine Testing Area is recommended in order to assess the extent of contamination, if any, that exists in this portion of JPG.

As with other open burning areas on site, soils at the Gator Mine burn area should be sampled in order to determine the vertical and areal extent, as well as the degree of contamination.

6.1.3 Recommendations for the Firing Line Area

All areas used for Red Lead Disposal (JPG-009) will need to be identified and properly located. When this is done, soil, surface and ground water sampling should be conducted in order to determine the vertical and areal extent of the lead contamination.

At JPG-010, the photographic laboratory, wipe samples of drains and the HVAC system, chip samples of stained portions of the floor, and soil samples surrounding the building should be taken.

It is recommended that soil sampling for lead around the perimeter of JPG-012, as well as wipe and air samples of the interior of the building be conducted.

The Area for Munitions Demilitarization, JPG-013, should be properly located, so that soil, surface and ground water can be sampled and analyzed for possible contamination.

Monitoring wells should be installed at JPG-027 and 028 in order to fully assess the impact that the disposal of solvents has had on ground water in the vicinity of these buildings. Ground water from these wells should be sampled. The re-sampling of the existing ground water monitoring wells at Building 279 (JPG-029) should be conducted. The need for additional wells in this area should also be examined.

The machine shop, building 105 (JPG-031), is used for the temporary storage of waste fluids (i.e. cutting oils, naphthalenes, solvents). The soils around the building, as well as chip sampling of the floors, is recommended.

JPG-032 and 033 have not been identified; the hazardous materials and wastes stored are unknown, as are the locations of the storage areas. It is recommended that these two areas be defined and located, so they may be properly assessed.

At JPG-034 and JPG-035 (Building 227 and Building 186, respectively) the sampling of the soils surrounding the outdoor storage areas is recommended. Wipe and/or chip samples of the floors where obvious spills occurred is also recommended.

Wipe sampling of hard surfaces and the HVAC systems should be conducted at each of the ammunition assembly areas to determine if explosive residues are present. Flame tests of cracks and crevices in these buildings is also recommended.

6.1.4 Recommendations for the Area North of the Firing Line

Soil and surface water samples should be collected at JPG-006 (Explosives Burning Ground) to determine if past burning activities caused contamination of the soil to occur.

The performance of limited soil and surface water sampling at JPG-016 (Ordnance Disposal Site) and JPG-017 (Landfill) is recommended. It is also recommended that a geophysical survey be conducted at JPG-017 be conducted in order to define the extent of the landfill.

JPG-018 should be located, and along with JPG-021 (Abandoned Well Disposal Site), should have samples of ground water collected. The Sediment Bottom Munitions Pond, JPG-019, should be screened for the presence of UXO. The water and sediment from the pond should be sampled for the presence of explosives, propellants, and metals. The Macadam Lined Test Pond (JPG-020) should be screened for the presence of UXO beneath the macadam liner. Soils under and around the pond should be sampled.

In order to determine the extent and degree of contamination of the soils at JPG-023 (Open Detonation Area), they should be sampled and analyzed for metals and explosives components. Seeps from the hillside just south of this area should be sampled in order to assess the impact that the detonation and burning activities has had on ground water.

Geophysical surveys should be conducted at the three solid waste landfills located north of the firing line (JPG -024, 025 and 026) in order to determine their vertical and areal extents. Surface waters and soils adjacent to these landfills should be sampled in order to determine the types of wastes that have been deposited in these locations. Ground water monitoring wells should be installed in order to characterize the ground water quality in the vicinity of these three SWMUs.

The area north of the firing line contains significant amounts of UXO; approximately 8600 acres have been used as designated impact/target areas. Approximately 50,000 acres are suspected as being contaminated with UXO. It has been estimated that over one and a half million (1,500,000) rounds of unexploded ordnance exist north of the firing line. The UXO represents both a physical (explosive) hazard and a chemical (toxic) hazard. Soils, surface and ground waters should be sampled and analyzed for metals and explosive constituents.

In order to assess the impact that the depleted uranium (DU) impact area has had on the environment, ground and surface water, and soil should be sampled to ensure that there is no migration of contamination toward or into ground water.

6.1.5 Recommendations for the Gate 19 Area

JPG-014 (Burning Ground) should be located properly. At the burning ground and Gate 19 Landfill), the re-sampling of the existing ground water monitoring wells is recommended. Upon completion of these activities, an evaluation of the need for additional wells should be made and the soil and ground water sampled as warranted.

6.1.6 Recommendations for Other Areas of Environmental Concern

Some buildings at the JPG facility should be surveyed for the presence of asbestos, PCBs, lead paint and radon gas. Additionally, wipe samples should be taken and analyzed for the presence of hazardous constituents in any building in which such materials may have been used or stored.

The removal and disposal of the PCB-containing oils in transformers which contain levels > 500ppm is currently being planned, for the entire electrical distribution system is being renovated. Floor stains in the transformer storage areas should be wiped and the samples analyzed for PCB concentration.

Asbestos material that presents an airborne health threat is currently being remediated. JPG already has an asbestos abatement program, and this should continue until all possible releases are mitigated.

The JPG underground storage tank management program should be continued, with required closure assessments, tank testing, etc. being conducted as necessary. Remedial action plans will need to be developed in cases of confirmed leaking underground storage tank systems.

Because soil and water contamination may have occurred as a result of UXO and other munitions related items being present in a very large portion of Jefferson Proving Ground, soils, surface water and ground water should be monitored for the presence of explosives, propellants, heavy metals, and other ordnance related materials.

6.2 Releasing of Property

An element of Ebasco's required work effort for this Enhanced PA is to consider what portions of the JPG facility can be released without restriction for sale to the general public. No part of JPG can be released at this stage of the base closure program. There are no areas of the JPG facility that can be released without a UXO sweep and removal, on the basis that UXO may be present. This

situation potentially exists anywhere north or south of the firing line, as well as the perimeter areas that surround the central building structures. This is documented in information provided in previous reports, including a map dating back to 1945 which indicates areas south of the firing line which contains "duds". The presence of large amounts of UXO in undefinable areas makes it necessary to consider that most of JPG's 55,000+ acres cannot be presently released on the basis that UXO may exist anywhere outside the area immediately adjacent to the building complex.

6.3 Summary

The conclusions and recommendations of the enhanced Preliminary Assessment are summarized in Table 1. The presence of large amounts of explosive ordnance on site dictates that additional studies be undertaken depending on the potential reuse of Jefferson Proving Ground.

The recommendation of Ebasco Environmental is that no part of the JPG facility be released for excess, unless, based on the results of the general environmental surveys, it is proven to be non-contaminated (with physical, chemical or explosive hazards).

TABLE 1: AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY

South of the Firing Line (West Side)

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Old Incinerator	JPG-001	Used to burn paper products, debris and small ammunition from the installation	Particulate matter, fuel oil	Air	Soil	This unit is not active; no current migration pathways	Soil sampling around building
Water Quality Lab	JPG-002	Operational at the STP since the 1960's; laboratory analysis includes flow, pH, BOD, suspended solids, fecal coliform, and residual chlorine	Waste chemicals		Soil	Sewer improvement programs and SOPs prevent contaminant releases	Soil sampling around the building;wipe samples of HVAC system/drains; chip sampling
Sewage Treatment Plant	JPG-003	Used for the primary and secondary treatment of wastewater at the installation; sludge is dried on the sludge drying bed and disposed of off post; wastewater is tested to confirm compliance with NPDES permit limitations	Liquid stream discharges and dry sludge material		Soil, Surface water	Sampling of sludge does not indicate contamination with silver (Ag)	Soil sampling
Burning Ground	JPG-004	Area once used for the open burning of explosives; dates of use unknown; currently overgrown with vegetation and not in use	TNT, DNT, heavy metals and solvents	Air	Soil	Potential migration pathway by leaching of contaminants through soils; no evidence of a release observed	Soil sampling
Landfill	JPG-005	1-acre landfill comprised of small filled-in trenches; depth unknown; used for dumping of film refuse from the photographic lab	Film (silver), solvents and lead		Soil	Potential migration pathway by leaching of silver and solvents through soils	Geophysical screening; soil sampling to the base of the landfill
Wood Storage Pile	JPG-007	Waste pile used for the storage of non-hazardous wood debris	None			Wood is on impermeable runway; wood is inert, non-hazardous; has no ability to migrate	
Contaminated Wood Storage Pile	JPG-008	Waste pile used for the storage of PCP-contaminated wood debris	PCP			Wood is stored on an impermeable runway; no distressed vegetation observed; current exposure potential is low	

TABLE 1: AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY

South of the Firing Line (West Side); Continued

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
New Incinerator	JPG-011	Utilized to incinerate solid waste consisting of paper product, debris, and inert munitions chemical components	Contaminants in ash	Air		The potential contaminant release mechanism is limited to air transport due to emissions from the incinerator	Soil sampling around the building
Fire Training Pit	JPG-030	Unlined open pit used for fire training purposes; wood debris is soaked with used diesel fuel and POL products and ignited	Heavy metals and petroleum products	Soil Air		The potential contaminant release mechanisms include migration through surface soils to ground water; an oily sheen was observed; residue coating of waste POL products on soils	Soil sampling
Temporary Storage (Building 305)	JPG-036	The site has been utilized since 1980 for the temporary storage of hazardous waste material prior to pick-up and removal by DRMO	Spills from stored material		Soil	All of the wastes are properly containerized or bagged; potential for migration or dispersal is limited; no evidence of release to the environment	Soil, wipe and chip sampling
UXO Contamination	NA	The area south of the firing line potentially contains significant amounts of UXO; contamination can most likely be attributed to the rocket, mine, and armor plate testing and ammunition dumping during the WWII era	Heavy metals, physical and chemical hazard		Soil, Ground water	The potential contaminant release mechanism includes leaching of metals and HE components through soils	Location of areas containing UXO, soil sampling
Possible Sulfur Disposal Area	NA	Area used for the disposal of yellow sulfur-like material	Unknown	Soil	Surface water	The potential contaminant release mechanism includes migration of yellow material through soils, and runoff into surface waters	Soil, water and sediment sampling
Burn Area	NA	A concrete pad and surrounding grassy area appeared to be the site of burning activity; no additional information on this area is available	Unknown		Soil, Surface, Ground water, Air	The potential contaminant release mechanism includes migration of black residue through soils to ground water and runoff into surface water	Soil and surface water sampling

TABLE 1: AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY

South of the Firing Line (East Side)

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Open Burning Area	JPG-022	Thermal treatment area operating under a RCRA Interim Permit; four burning trays are utilized at this site for burning of waste and unused/unusable propellant deemed unsafe to dispose with incineration	EP Toxicity metal, explosive residue	Air	Soil	The potential contaminant release mechanisms include air transport and leaching of contaminants through soils to GW; the effectiveness of the containment device, location of the burn area, and the SOPs combine to minimize contact between waste ash and the environment; no evidence of release to soil was observed, however burning occured here prior to installation of the trays	Soil sampling
UXO Contamination	NA	The area south of the firing line reportedly contains significant amounts of UXO; contamination can most likely be attributed to the rocket, mine, and armor plate testing and ammunition dumping during the WWII era	Heavy metals, in addition to significant physical and chemical hazards		Soil, Ground water	The potential contaminant release mechanism includes leaching of metals through soils	Location of ordnance materials; soil sampling
Gator Mine Testing Area	NA	This area is used for the testing of mines	Heavy metals, explosive residues		Soil, Surface, Ground water	The potential contaminant release mechanism includes leaching of contaminants through soils	Removal of ordnance materials; soil, surface and ground water sampling
Gator Mine Burn Area	NA	Scrap wood, wire, and plastic is periodically burned at this area	Heavy metals		Soil Air	The potential contaminant release mechanism includes leaching of contaminants through soils	Soil sampling

TABLE 1: AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY

Firing Line Area

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Red Lead Disposal Area	JPG-009	Reportedly used for the disposal of paint residuals (red lead), and lead oxides used in inert rounds; size and dates of use unknown; site location unknown	Lead		Soil, Surface, and Ground water	Previous studies have indicated that this area is a potentially hazardous waste disposal site; potential contaminant release mechanisms are unknown	Locate the disposal area; soil, surface water, and ground water sampling
Photographic Laboratory	JPG-010	Processes, develops, and prints large quantities of black and white/color film; waste toner is diluted and discharged through a floor drain to the sanitary sewer system; two silver recovery units are in place	Silver, waste toner and developer		Soil	Heavy metals normally bond to organic material in soils and clay and do not migrate appreciable distances unless under acidic conditions; the waste toner and developer drained into the sewer system has little migration potential; the potential for migration into ground or surface water is minimal	Wipe samples of drains, HVAC; sample soils surrounding the building; chip sampling
Indoor Range	JPG-012	Utilized to test small arms for training until the early 1980's; area closed due to concern over interior contamination with lead oxides and lead dust derived from lead bullets used in the range	Lead oxides and lead dust		Soil, Air, Building interior	The potential migration pathways include the presence of lead in soils, on interior building surfaces, and lead dust in the air	Soil sampling for lead; wipe sampling of interior surfaces; air sampling inside the building
Munitions Demilitarization	JPG-013	Reportedly used for the demilitarization of munitions; size and dates of use are unknown; locations are unknown	Heavy metals, DNT, TNT		Soil, Ground water	Previous studies indicate that the area is a potentially hazardous waste diposal site;	Locate the disposal area; soil, surface water, and ground water sampling
Solvent Pit (Building 602)	JPG-027	Utilized as a surface disposal area from 1970 to 1978 for the dumping of TCE solvent and degreaser, other unknown solvents for percolation; pit no longer used	TCE and other solvents	Soil	Ground water	TCE and other solvents have the ability to migrate, creating a high potential for ground water contamination; soil sampling indicated VOC contamination; the lateral extent of contamination is expected to be localized in the immediate vicinity impact on ground water unknown	Install ground water monitoring wells; sample ground water

TABLE 1: AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY

Firing Line Area; Continued

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
(Building 617)	JPG-028	Utilized as a surface disposal area from 1970 to 1978 for the dumping of TCE solvent and degreaser, and other unknown solvents for percolation; pit no longer used	TCE and other solvents	Soil	Ground water	TCE and other solvents have the ability to migrate, creating a high potential for ground water contamination; soil sampling indicated VOC contamination; the lateral extent of contamination is expected to be localized in the immediate vicinity; impact on ground water unknown	Install ground water monitoring wells; sample ground water
Solvent Pit (Building 279)	JPG-029	Utilized as a surface disposal area from 1970 to 1978 for the dumping of TCE solvent and degreaser, and other unkown solvents for percolation; pit no longer used	TCE and other solvents	Soil, Ground water		TCE and other solvents have the ability to migrate creating a high potential for ground water contamination; soil sampling indicated VOC contamination; VOC contamination has been found in one downgradient well; non-detection in two wells further downgradient may indicate that no significant migration has occured	Re-sample ground water monitoring wells; evaluate need for additional wells
Temporary Storage, Machine Shop (Building 105)	JPG-031	Used since 1970's for the temporary storage of varying amounts of waste fluids such as cutting oil, cooling fluids, and naphthalenic waste fluids stored in 55 gallon drums prior to removal by DRMO	Naphthalenic oils		Soil	No evidence of a release exists at this location; napthalenic oils are suspected carcinogens and are considered hazardous when spent; waste fluids cannot migrate beyond the shop unless there is an uncontrolled spill in the doorway; exposure potential is low to minimal as the only hazard is to workers handling waste oil and fluid drums	Soil and chip sampling

TABLE 1: AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY

Firing Line Area; Continued

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Assumed Temporary Storage	JPG-032	Reportedly used as a storage area; size of the area, and possible source materials are unknown	Unknown			The potential contaminant release mechanisms are unknown	Define and locate the site
Assumed Temporary Storage	JPG-033	Reportedly used as a storage area; size of the area, and possible source materials are unknown	Unknown			The potential contaminant release mechanisms are unknown	Define and locate the site
Temporary Storage, Weapons Maintenance (Building 227)	JPG-034	Warehouse used for repairing and refurbishing gun tubes and other weapons and weapons parts; also utilized for storage of waste solvent and oil; when full, the drums are picked up by DRMO	Solvents and waste oil		Soil	The solvents and waste oil have the potential to migrate into the shallow surface deposits and shallow ground water in the event of a spill; minor spillage has occured during handling of the drums	Soil and chip sampling
Temporary Storage, Motor Pool (Building 186)	JPG-035	Warehouse used as a maintenance garage for repairing heavy equipment and vehicles; also utilized for temporary storage of solvent, No. 1 fuel oil, undrained batteries, light/heavy scrap metal storage containers; oil separator pits	Solvents and waste oil		Soil	The solvents and waste oil have the potential to migrate into the shallow surface deposits and shallow ground water in the event of a spill; minor spillage has occured during handling of the drums	Sample surrounding soils
Ammunition Assembly Area	NA	Several buildings at JPG are utilized for assembly of munitions	Explosive residue		Air, Building interior	Various projectiles are assembled in strict accordance with safety protocols; the possibility exists that explosive residues are present on building surfaces and HVAC systems	Wipe sampling of building surfaces and HVAC systems; Flame test of cracks and crevices

TABLE 1: AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY

North of the Firing Line

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Explosives Burning Ground	JPG-006	Thermal treatment area previously used for the open burning on the ground of powdered explosives; area no longer used	TNT, DNT, metals	Air	Soil, Surface, and Ground water	Black residue present on the surface; there is no trace of open burning on the ground; the potential contaminant release mechanism is migration through soils to ground water	Soil, and surface water sampling
Ordnance Disposal Site	JPG-016	Previously utilized for disposal of munitions-related components, including chemical explosives; area consists of a water-filled pit which contains ordnance	Lead, chrome, TNT, DNT		Soil Water	It is unknown if the shells are explosive or not; lead, chrome, TNT and DNT have the ability to leach into the surrounding soils; physical hazards are of most concern	Soil and surface water sampling
Landfill	JPG-017	Abandoned landfill of unknown depth; utilized from 1960 - 1981 for burial of inert munitions; buried wastewater-filled pits containing inert shells make up the 8-acre site	Metals, explosives residuals		Soil, Ground water	The metal parts may contain explosives or other hazardous constituents; metals can migrate over time; ground water is relatively shallow and may be a release pathway to the environment	Geophysics to determine the extent of the landfill, soil and ground water sampling
Abandoned Well Disposal	JPG-018	Abandoned water well used for the disposal of munitions-related materials; 100 - 200 riot control grenades were dumped into this farm well; ammunition can be seen in the vicinity of the well	Metals, explosives		Ground water	It is unknown whether the shells are explosive or not; riot control agent (CS/CN) if released will hydrolize while ignitor/pyrotechnic mix and metals may leach into the ground water as there is direct contact	Sample ground water
Munitions Test Pond	JPG-019	Previously used sediment bottom munitions test pond; pond drained and no munitions found; pond has refilled with water	UXO, metals, explosives		Soil, Sediment, Water	It is unknown if UXO is located beneath the Macadam liner; lead, chrome, TNT, and DNT may migrate into soils	Sample sediment, and water; geophysical survey to locate UXO

TABLE 1: AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY

North of the Firing Line; Continued

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Macadam Lined Test Pond	JPG-020	Reported to be contaminated with munitions and the herbicide Ureabor; this pond is presently dry	UXO, metals, explosives		Soil, Water	It is unknown if the shells are potentially explosive; lead, chrome, TNT, and DNT may leach into surrounding soils	Geophysical survey to locate UXO; sample soil under and around pond
Abandoned Well/ Cistern Disposal	JPG-021	Abandoned water well used for the disposal of fuses, repeated attempts to locate the well/cistern have failed	Metals, explosives		Ground water	It is unknown whether the fuses are explosive or not	Locate well/cistern; ground water sampling
Open Detonation Area	JPG-023	Thermal treatment area operating under a RCRA Interim Status Permit for open and above ground detonation; open burning occurs in a heavy steel mesh burning cage	Metals, TNT, DNT	Air	Soil	Leaching of metals, propellants, and explosives are included as potential migration pathways	Soil sampling; sampling of the seeps down slope of the detonation area
Landfill	JPG-024	Abandoned landfill of unknown depth used for the disposal of solid waste from the Old Timber Lodge; waste includes putrescibles, paper and other types of solid waste	Leachate		Soil, Ground water	The wastes buried have potential to migrate into the soils and ground water; no evidence of leachate or other releases exist at this site	Locate limits of landfill; sample soil, ground water and surface water
Landfill	JPG-025	Abandoned landfill of unknown depth used for the disposal of solid waste and construction debris; waste includes putrescibles, paper and other types of solid waste	Leachate		Soil, Ground water	The wastes buried have potential to migrate into the soils and ground water; no evidence of leachate or other releases exist at this site	Locate limits of landfill; sample soil, ground water and surface water
Landfill	JPG-026	Abandoned landfill of unknown depth used for the disposal of solid waste and construction debris; waste includes putrescibles, paper and other types of solid waste	Leachate		Soil, Surface, Ground water	The wastes buried have potential to migrate into the soils and ground water; no evidence of leachate or other releases exist at this site	Locate limits of landfill; sample soil, ground water and surface water

TABLE 1: AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY

North of the Firing Line; Continued

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
UXO Contamination	NA	The area north of the firing line contains significant amounts of UXO; approximately 8600 acres have been utilized as designated impact or target areas; approximately 50,000 acres are suspected of being contaminated with UXO	Metals, physical hazard; explosives hazard		Soil, Surface, Ground water	The potential contaminant release mechanism includes migration of contaminants through soils into surface and ground water; explosive hazard0	Location of all ordnance materials; soil, surface and ground water sampling
Depleted Uranium Area	NA	More than 60,000 kg of low-level radioactive depleted uranium penetrators were fired on a 2-sq. mile area	Uranium		Soil, Surface, Ground water	The potential contaminant release mechanism includes leaching of low-level radioactive contaminants through soils to ground water; while the DU rounds represent a radioactive hazard, uranium has not been detected in the ground water	Soil sampling and continued surface and ground water sampling
Forest Fires	NA	Forest fires have occured occasionally due to explosions of test shells	Particulates	Air	Soil	These are now usually controlled burns conducted by the JPG Fire Department	Continue controlled burns to minimize the chance of an unwanted, uncontrolled burn

TABLE 1: AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY

Gate 19 Area

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Burning Ground	JPG-014	Used for the open burning of construction debris and waste POL, and solvents; area overgrown with vegetation; aerial photographs show liquid filled trenches and mounded material during its use from the 1950's to the 1970's; reportedly the disposal site of TCE and paint	TCE and lead	Air	Soil Ground water	Though this area is no longer used for burning of any type of material, the reports of TCE and paint dumping indicate that a release to the environment may have occurred in this area; wells installed at this location have not detected contamination	Locate area, sample soils, continue to sample ground water
Landfill	JPG-015	Used for disposal of construction debris and asbestos; comprised of 12 acres; reportedly the site of TCE and lead paint disposal	TCE and lead	Ground water	Soil	Hydrogeological analysis indicates that elevated levels of acetone are present; no lead or TCE were detected; no ground water contaminant plume has been detected thus far	Continue to sample existing wells; evaluate need for additional wells

TABLE 1: AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY

Other Environmental Concerns

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
PCB-containing Oils	NA	252 transformers are located at JPG; analysis indicated that 7 of the transformers contained PCBs >500 ppm; upcoming change of the electrical distribution system will require the replacement of all electrical devices, including transformers, capacitors and breakers that contain PCBs	Polychlorinated Biphenyls			The inventory of tranformers did not indicate if a release of PCB liquids had occurred; potential PCB-contaminant release mechanisms include leaks from transformers onto soils and pavement	Remove and properly dispose of PCB transformers; wipe samples of floor stains in the transformer storage area
Asbestos	NA	Asbestos containing materials are present in various construction materials of several buildings; a preliminary survey estimated approximately 197,000 linear feet; asbestos shingles/siding contribute an additional 258,000 square feet; an on-going asbestos removal program is in place	Asbestos fibers	Air		The asbestos encountered were indicative of a significant amount of friable asbestos; a brief visual inspection noted that pipe lagging, and broken ceiling tiles were exposed to the natural elements of wind, heat, and water	Remove and dispose or encapsulate any asbestos material identified during an asbestos survey as presenting a threat to human health
Underground Storage Tanks	NA	There are 54 USTs located at various sites; the tanks were installed between 1941 & 1985; the tanks vary in size (300 and 25000 gallons) and construction (steel to coated steel) contents include No. 2 fuel and diesel oil, leaded and unleaded gasoline, kerosene and white gas	Volatile organics, lead, TPH		Soil Ground water	Recently promulgated UST regulations require the upgrade or removal/replacement of USTs to meet specific measures for leak detection, prevention, and remediation of releases; it is unknown whether the tanks are in compliance with the new regulations; the age of the tanks create the potential for leaks to surrounding soils; JPG currently has a UST management plan which provides for UST removal	Remove & dispose of the remaining USTs according to JPG's UST management program; perform required closure assessments; develop corrective actions plans as needed

TABLE 1: AREAS REQUIRING ENVIRONMENTAL EVALUATION SUMMARY

Other Environmental Concerns; Continued

Areas Requiring Environmental Evaluation	SWMU #	Description	Suspected Contaminants	Releases to Media		Conclusions	Recommendations
				Known	Suspected		
Surface Water	NA	Several creeks traverse the proving ground; these include Otter Graham, Little Graham, Marble, Big, and Harberts Creeks	Explosives: TNT DNT, DU, Pesticides Metals		Surface water	Potential for contaminant release to surface waters on site is high; surface waters on site may carry contaminants from off-site to JPG	Conduct surface water and sediments sampling along major streams at JPG and at the installation boundary
Ground Water	NA	The bedrock in the JPG area does not have dependable water-bearing strata; public/private utilities provide water service to practically all households in the small rural areas surrounding JPG; nearly all of this water is pumped from the Madison well field which yields 8.3 MGD from the sand and alluvial aquifer of the Ohio River Valley; a number of private well users are in the surrounding area	Unknown		Ground water	Private wells could be considered as potential off-site receptors if contaminants are released via ground water flow from JPG; the regional flow appears to be in the south-south-west direction; however, geologic features alter the flow direction especially locally	Conduct ground water sampling around the perimeter of the installation, in addition to around SWMUs and AREEs as appropriate
Radon	NA	Radon gas is generated by the decay of uranium in the bedrock or other subsurface features; this gas can potentially exist in any of the buildings at JPG	Radon		Air		Conduct radon gas survey at each building
Lead Paint	NA	Several of the buildings at JPG were reportedly painted with lead paint	Lead				Conduct lead paint survey

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APPENDIX 1
TYPES OF AMMUNITION TESTED AT JPG

DISK 10 13 MAR 89 JPG TEST WORKLOAD
TESTITEM

NOMEN	MODEL	CAL		
PROJ	M509 MPTS	8 IN	Howitzer	
MTR BODY	XM650E5	8 IN	Howitzer	
PROP,M31A1	M31A1/M106	8 IN	Howitzer	
PROJ	M509A1 HE	8 IN	Howitzer	
PROP	M31/M188	8 IN	Howitzer	
FUZE	M577	8 IN	Howitzer	
PROP,M2	M2/M106	8 IN	Howitzer	
	M583	8 IN	Howitzer	
PROP,M188A1	M188A1/M106	8 IN	Howitzer	
MTR ASSY	M650	8 IN	Howitzer	
CHG	M188A1	8 IN	Howitzer	
WHD	M650 AFT	8 IN	Howitzer	
PROJ	M106 MPTS	8 IN	Howitzer	
PROJ	M404	8 IN	Howitzer	
PROJ	M106 HE	8 IN	Howitzer	
FUZE	M582	8 IN	Howitzer	
SPOT CHG	M509	8 IN	Howitzer	
MTR BOD	M650	8 IN	Howitzer	
PROP	M1/M1	8 IN	Howitzer	
PROJ	M509A1 MPTS	8 IN	Howitzer	
PROJ,XM650	M9, SC	8 IN	Howitzer	
DLY ASSY	M650	8 IN	Howitzer	
PROJ	M509 HE	8 IN	Howitzer	
CART	M623	165 MM	Howitzer	
PRIMER	M73 ELEC	165 MM	Howitzer	
PROJ	M104	165 MM	Howitzer	
CART	M123	165 MM	Howitzer	
PROJ	M624 HE	165 MM	Howitzer	
PROJ	M624 MPTS	165 MM	Howitzer	
FUZE,M557	M557/M107	155 MM	Howitzer	
PROJ	M101B1	155 MM	Howitzer	
PROJ	M107 HE	155 MM	Howitzer	
PROJ	M449A2	155 MM	Howitzer	
PROJ	M449E2	155 MM	Howitzer	
ASSY BASE BLEED	XM864 ICM	155 MM	Howitzer	
PROJ	M107 MPTS	155 MM	Howitzer	
PROJ	PXR-6325	155 MM	Howitzer	
DLY ASSY	M549	155 MM	Howitzer	
PRIMER	MK2A4	155 MM	Howitzer	
PROJ	M549	155 MM	Howitzer	
PROJ, ICM	M825 WP	155 MM	Howitzer	SMOKE
DLY COMP	M549	155 MM	Howitzer	
PRIMER,M82	M82/M107	155 MM	Howitzer	
PROJ,CHEM	M110	155 MM	Howitzer	CHEMICAL
PROJ	M741	155 MM	Howitzer	
PROJ	M118A2B1	155 MM	Howitzer	
PROJ,M549	M739, FUZE	155 MM	Howitzer	

Encl 2

FUZE,M564	M564/M1	105 MM	Howitzer
CART	M314A1	105 MM	Howitzer
~~FUZE~~	~~M84/314~~	~~105 MM~~	~~Howitzer~~
CART	M60A2	105 MM	Howitzer
CASE	M14B4	105 MM	Howitzer
CART	M760	105 MM	Howitzer
CART,ILLUM	XM314A2E1	105 MM	Howitzer
CART	M444	105 MM	Howitzer
PROP	M200/M760	105 MM	Howitzer
	M564	105 MM	Howitzer
FUZE	M84A1	105 MM	Howitzer
PRIM,M80A1	M737, PROJ	105 MM	Howitzer
CART,ILLUM	M314A3	105 MM	Howitzer
FUZE,M739	M739/M1	105 MM	Howitzer
	M583	105 MM	Howitzer
PROJ	M60 WP	105 MM	Howitzer SMOKE
FUZE	M577	105 MM	Howitzer
FUZE,M577	APG, SC	105 MM	Howitzer
FUZE,M565	APG SC	105 MM	VAR
FUZE,M577A1	APG SC	105 MM	VAR
CART	M112	90 MM	Howitzer
FUZE,M51A5	M48,PROJ	75 MM	Howitzer
PROJ	T50E2	75 MM	Howitzer
CART	T50E2	75 MM	Howitzer
CART,T50E2	T6E3B1	75 MM	Howitzer
CART	M337A2	75 MM	Howitzer
FUZE,M51A5	M51A5/M1	VAR	Howitzer
FUZE	M565	VAR	How/Mort
FUZEM577	M577/M1	VAR	Howitzer
FUZE	M577A1MTSQ	VAR	Howitzer
FUZE	M582A1	VAR	Howitzer
FUZE	M739A1	VAR	Howitzer
FUZE	M739A1 MPTS	VAR	Howitzer
FUZE	M739A1 PD	VAR	Howitzer
FUZE,T2 CHG	T2 CHG/M739	VAR	Howitzer
FUZE,M577A1	T2 SC	VAR	Howitzer
BOOS	M125A1	VAR	Howitzer
FUZE	M508	VAR	Howitzer
FUZE	M509A1	VAR	VAR
CART	M344A1	106 MM	Rec Rifle
CART	M94B1	106 MM	Rec Rifle
PROJ	M346A1	106 MM	Rec Rifle
PROJ	XM595	106 MM	Rec Rifle
PROP	M26	106 MM	Rec Rifle
TRACER	M5A2B1	106 MM	Rec Rifle
CHG	M67	105 MM	Rec Rifle
PRIMER	M57	105 MM	Rec Rifle
PROJ	M306A1	57 MM	Rec Rifle
CAN	T25E5	57 MM	Rec Rifle
CART,T25E5	T25E5	57 MM	Rec Rifle
FUZE,M503A1	M503A1/M306A1	57 MM	Rec Rifle

PROJ,ILLUM	M118A2B1	155 MM	Howitzer
PROJ,M107	M73,FUZE	155 MM	Howitzer
PROP,M119A1	M119A1/M107	155 MM	Howitzer
PROJ, ICM	DM642	155 MM	Howitzer
CHG	M119A2	155 MM	Howitzer
PROJ, ICM	M692	155 MM	Howitzer
BOOST,M125A1	M125A1/M107	155 MM	Howitzer
PROP,M6	M6/M107	155 MM	Howitzer
CHG	M203	155 MM	Howitzer
FUZE	M582	155 MM	Howitzer
PROP	M203A1	155 MM	Howitzer
PROP	M1/M4	155 MM	Howitzer
PROP,M30A1	M30A1/M107	155 MM	Howitzer
PROJ	M101	155 MM	Howitzer
PROP	M31A1E1	155 MM	Howitzer
CHG	PXR-6359	155 MM	Howitzer
PROP	M31A2	155 MM	Howitzer
PRIMER	MK2A4	155 MM	Howitzer
CHG	M3A1	155 MM	Howitzer
PRIMER	M82	155 MM	Howitzer
PROP,M3A1	M3A1/M107	155 MM	Howitzer
PROJ	M731	155 MM	Howitzer
FUZE,M500	M500/M107	155 MM	Howitzer
PROP	M1/M3A1	155 MM	Howitzer
CHG	M4A2/M107 PROJ	155 MM	Howitzer
FUZE,M582A1	M582A1/M107	155 MM	Howitzer
PROJ	M485A2 MPTS	155 MM	Howitzer
PROP	M1/M4A2	155 MM	Howitzer
PROJ	M485A2 ILL	155 MM	Howitzer
PRIMER	MK2B4	155 MM	Howitzer
PROJ	M485	155 MM	Howitzer
PROP	CBI	155 MM	Howitzer
PROJ	M483A1 MPTS	155 MM	Howitzer
PROP	M6/M119A2	155 MM	Howitzer
PROJ	M483A1 HE	155 MM	Howitzer
SPOT CHG	M483	155 MM	Howitzer
PROJ	M449	155 MM	Howitzer
PROJ	M718 RAAM	155 MM	Howitzer
PROJ	M825 MPTS	155 MM	Howitzer
FUZE	M577	155 MM	Howitzer
PROJ	M483	155 MM	Howitzer
CART	M411E3	152 MM	Howitzer
PROJ	M411E2	152 MM	Howitzer
PROP	M1/M724A1	105 MM	Howitzer
CART, M1	M73 ,FUZE	105 MM	Howitzer
PRIMER	M28B2	105 MM	Howitzer
CART	M1	105 MM	Howitzer
PROJ,M1	APG SC,FUZE	105 MM	Howitzer
CART	M395 BLANK	105 MM	Howitzer
PROP	M1/M67	105 MM	Howitzer
FUZE	M739	105 MM	Howitzer
FUZE	M582	105 MM	Howitzer

FUZE, M557	M557/M71	90 MM	Gun
PROJ,SMOKE	M71	90 MM	Gun
CART	M71A1	90 MM	Gun
PROJ,WP	M313	90 MM	Gun
CART,M19	M82,PROJ	90 MM	Gun
SHOT	M332A1	90 MM	Gun
TRACER,APC	M82,PROJ	90 MM	Gun
CART	M431E1	90 MM	Gun
PROJ	T300E59	90 MM	Gun
PROP,M17	M318	90 MM	Gun
PROJ	T33E7	90 MM	Gun
CART	M371E1	90 MM	Gun
CART	M19B1	90 MM	Gun
PRIMER	M58	90 MM	Gun
CART	XM764	90 MM	Gun
CART,M26B1	M42A1	76 MM	Gun
FUZE,M500	M42A1	76 MM	Gun
FUZE	M51A5	76 MM	Gun
CART	M496	76 MM	Gun
FUZE	T177E4	76 MM	Gun
PROJ	M42A1	76 MM	Gun
PROP	M30/M760	150 MM	Tank Gun
CART	M831	120 MM	Tank Gun
CART	M830	120 MM	Tank Gun
CART	M865	120 MM	Tank Gun
PROJ	M831	120 MM	Tank Gun
PROJ	M865	120 MM	Tank Gun
CART	M829	120 MM	Tank Gun
PROJ	M456A2	105 MM	Tank Gun
PROP	M30/M456A2	105 MM	Tank Gun
PROP	M14/M490A1	105 MM	Tank Gun
CART WP	M416	105 MM	Tank Gun
CART,M323	M51A5,PROJ	105 MM	Tank Gun
CASE	M148A1B1	105 MM	Tank Gun
CART	M392/735	105 MM	Tank Gun
PRIMER	M83	105 MM	Tank Gun
CART	M724	105 MM	Tank Gun
TRACER	M13	105 MM	Tank Gun
CART	M393A1	105 MM	Tank Gun
PROP, M30	M735	105 MM	Tank Gun
CART	M724A1	105 MM	Tank Gun
PROP	M30/M833	105 MM	Tank Gun
CART	M728	105 MM	Tank Gun
PROJ	XM900E1	105 MM	Tank Gun
CART	M833	105 MM	Tank Gun
PROJ	M833	105 MM	Tank Gun
CART	M490A1	105 MM	Tank Gun
CART	M490	105 MM	Tank Gun
PROJ	M489	105 MM	Tank Gun
CART	M392A1E1	105 MM	Tank Gun
PROJ	FP105	105 MM	Tank Gun
TRACER,M13	M489, PROJ	105 MM	Tank Gun

CASE	M14	105 MM	Tank Gun
PROP	M30/M490	105 MM	Tank Gun
CASE	M115B1	105 MM	Tank Gun
PROJ	M489A1	105 MM	Tank Gun
FUZE	M534A1	105 MM	Tank Gun
CART	M456	105 MM	Tank Gun
PRIMER	M80A1 ELEC	105 MM	Tank Gun
TRACER	M13/M489	105 MM	Tank Gun
PRIMER	M80	105 MM	Tank Gun
	M494	105 MM	Tank Gun
PROP	M1/M737	105 MM	Tank Gun
CART	M456A2	105 MM	Tank Gun
PRIMER	M120	105 MM	Tank Gun
CART,M329A2	T2 SC	4.2 IN	Mortar
CART	XM453E4	4.2 IN	Mortar
CHG	M205	81 MM	Mortar
FUZE	M567 MPTS	81 MM	Mortar
PROP	M10/M205	81 MM	Mortar
FUZE	M567 PD(LAP)	81 MM	Mortar
PROP	M218/M819	81 MM	Mortar
FUZE,M567	M567/M374	81 MM	Mortar
CHG	M220/M879	81 MM	Mortar
FUZE,M567	M567/M374A2	81 MM	Mortar
BODY,ILLUM	M301	81 MM	Mortar
FUZE M577	M56B2	81 MM	Mortar
CART,ILLUM	M301A3	81 MM	Mortar
IGN CTG	M66A1	81 MM	Mortar
CART,M362	M362	81 MM	Mortar
CTG IGN	M66A1	81 MM	Mortar
PROJ	M374A1	81 MM	Mortar
PRIMER,M71A1E1	M71A1E1/M374	81 MM	Mortar
CART	M374A3	81 MM	Mortar
IGN CTG	M752	81 MM	Mortar
PROP	M38/M819	81 MM	Mortar
CART	M821 HE	81 MM	Mortar
FUZE	M524A5	81 MM	Mortar
CART	M853A1 ILLUM	81 MM	Mortar
FUZE,M524A6	M524A6/M374	81 MM	Mortar
CART	M879	81 MM	Mortar
CHG	M219/M853	81 MM	Mortar
CART	M880	81 MM	Mortar
CART,ILLUM	M301A2	81 MM	Mortar
PROP	M9/81MM	81 MM	Mortar
CART	M374, PROJ	81 MM	Mortar
PROP	M9/M185	81 MM	Mortar
CART	M375A3	81 MM	Mortar
PROP	M9/M285	81 MM	Mortar
FUZE,M524A6	M524A6	81 MM	Mortar
PROP	M9/M299	81 MM	Mortar
IGN CTG	M299	81 MM	Mortar
PROP	M9/M5	81 MM	Mortar
CART	M374A2	81 MM	Mortar
PROP	M9/M90A1	81 MM	Mortar

IGN CTG	XM752E1	81 MM	Mortar	
PROJ	M43A1B1	81 MM	Mortar	
FUZE,M84A1	M301A3,CART	81 MM	Mortar	
PROP INC	PROP INC	81 MM	Mortar	
FUZE	M734	60 MM	Mortar	
CART	M302A2	60 MM	Mortar	
FUZE	M732 ISC	60 MM	Mortar	
CART	M888	60 MM	Mortar	
CART,ILLUM	M83A3	60 MM	Mortar	
IGN CART	M702	60 MM	Mortar	
PROJ	M720	60 MM	Mortar	
FUZE, M935	APG SP	60 MM	Mortar	
FUZE	M936 PD	60 MM	Mortar	
FUZE	XM935 MPTS	60 MM	Mortar	
PROP	M181	60 MM	Mortar	
PRIMER	M32	60 MM	Mortar	
PROJ	M302	60 MM	Mortar	
PRIMER,M32	M49A2	60 MM	Mortar	
FUZE	M935 MPTS	60 MM	Mortar	
HD ASY,T336E7	M49A3,PROJ	60 MM	Mortar	
CHG	M9/M702	60 MM	Mortar	
CART	M49A4	60 MM	Mortar	
FUZE,M65A1	M65A1/M83A3	60 MM	Mortar	
CART	M50A3	60 MM	Mortar	
CHG	M204	60 MM	Mortar	
IGN CTG	M5A2	60 MM	Mortar	
FUZE	M935	60 MM	Mortar	
CART	M722 SMOKE	60 MM	Mortar	SMOKE
PROP	M10/M204	60 MM	Mortar	
FUZE,M935	M935/M720	60 MM	Mortar	
CART	M302A1	60 MM	Mortar	
CART	M720	60 MM	Mortar	
IGN CTG	M285	81 MM	Mortar	
CART	M918	40 MM	Gun	
CART	M385	40 MM	Gun	
CART	XM429	40 MM	Gun	
CART	XM576E1	40 MM	Gun	
FUZE	M433	40 MM	Gun	
CART	M430	40 MM	Gun	
TRACER	MK11	40 MM	Gun	
CART	MK2	40 MM	Gun	
	M383	40 MM	Gun	
CART,SIG	XM585	40 MM	Gun	
FUZE	M439	40 MM	Gun	
CART	M406	40 MM	Gun	
FUZEM505	M505/T282E1	20 MM	Gun	
PROP,IMR7013	TPM99	20 MM	Gun	
PROJ	M56A1	20 MM	Gun	
SHOT,APT	M312E1	20 MM	Gun	
CART	XM220	20 MM	Gun	
CART	TPM99	20 MM	Gun	
PROJ	M55A2	20 MM	Gun	
CART,M21A1	M95,PROJ	20 MM	Gun	

CART,BALL	M55A1	20 MM	Gun
PROJ	T282E1	20 MM	Gun
CART,ELEC	M97A1	20 MM	Gun
CART	M97	20 MM	Gun
PRIM,T85E3	TPM99,CART	20 MM	Gun
MINE	BLU91/B AT-20	N/A	Mine
MINE	M21	N/A	Mine
MINE	M19	N/A	Mine
MINE	M26	N/A	Mine
MINE	M16/15/21	N/A	Mine
MINE	M15	N/A	Mine
MINE	M21,19,15	N/A	Mine
MINE	BLU92/B	N/A	Mine
MINE	M18A1	N/A	Mine
ROCKET	M72A1	66 MM	Rocket
ROCKET	M72A2	66 MM	Rocket
ROCKET	M73	35 MM	Rocket
FUZE	M404A1	3.5 IN	Rocket
ROCKET	M28A2	3.5 IN	Rocket
ROCKET	M151	2.75 IN	Rocket
FLARE	M49A1	N/A	Signal
SIG ILLUM	M39A2	N/A	Signal
SIG,ILLUM	M159	N/A	Signal
SIG ILLUM	M58A1	N/A	Signal
SIG,ILLUM	M158	N/A	Signal
SIG, ILL	M127A1	N/A	Signal
SIG ILLUM	M58A2	N/A	Signal
SIMULATOR	M21	N/A	Simulator
SIMULATOR	M116A1	N/A	Simulator
SIMULATOR	M118 ILLUM	N/A	Simulator
SIMULATOR	M80	N/A	Simulator
SIMULATOR	M117	N/A	Simulator
SIMULATOR	M115A2	N/A	Simulator
SIMULATOR	M17/M19	N/A	Simulator
SIMULATOR	M74A1	N/A	Simulator
SIMULATOR	M119	N/A	Simulator
DEMO	M180	N/A	Demo Kit
TRACER	M17	50 CAL	Gun
	M33	50 CAL	Gun
GRENADE	M31	30 CAL	Gun
CART	M744	22 MM	SUBCAL
CART,22SUB	APG SC	22 MM	SUBCAL

APPENDIX 2
HAZARDOUS WASTE MANAGEMENT PLAN

TABLE OF CONTENTS

LIST OF TABLES

1. INTRODUCTION:

The Resource Conservation and Recovery Act (RCRA) provides for a national program to protect public health and the environment by requiring proper management of hazardous waste. The initiation of a Hazardous Waste Management Plan (hereafter referred to as HWMP) at Jefferson Proving Ground (JPG), as required by 40 CFR 264, 265, 270, will minimize hazards to health and damage to the environment. The HWMP addresses management procedures required to obtain and remain in remain in regulatory compliance with the federal regulations outlined in RCRA. Since JPG is located within the state of Indiana, the state regulations (320 IAC 4.1-15 THROUGH 4.1-32) are also required to be complied with.

Under the authority of RCRA, the Environmental Protection Agency (EPA) has developed standards and procedures that must be followed by all persons that generate, transport, treat, store, or dispose of hazardous waste. By developing and following a HWMP, JPG will attempt to:

A. Establish sound management practices including chemical tracking system to promote the smooth flow of hazardous materials for procurement/generation through ultimate disposal at a permitted disposal facility.

B. Minimize health hazards and environmental damage caused by use and misuse of hazardous materials and supplies. Limit use of toxic or hazardous chemicals to the extent practicable.

C. Substitute a safer material for a hazardous material wen feasible.

D. Conserve resources by reusing and recycling hazardous materials.

E. Operate hazardous waste storage and treatment facilities in environmentally acceptable and in compliance with 40 CFR requirements.

F. Dispose of hazardous waste in an environmentally acceptable manner and in compliance with 40 CFR requirements.

G. Establish an informal board to review the management of hazardous wastes on the installation.

The responsibilities of the Hazardous waste Manager and the Hazardous Waste Management Board are listed in the HWMP. The plan lists a current inventory of all hazardous materials used and hazardous wastes generated at the installation. The current management practices and some suggested improvements are discussed. Also, the treatment and storage facilities at JPG are identifies. The HWMP incorporates, by reference, the necessary plans required by Federal/State hazardous waste regulations. These plans include storage, treatment, disposal plan, a waste analysis plan, inspection plan, training plan; spill prevention, control and countermeasures plan (SPCCP); installation spill contingency plan (ISCP); and closure/post-closure plans.

2. REFERENCE:

A. Resource Conservation and Recovery Act. Subtitle C - Hazardous Waste Management, and Subtitle F - Federal Responsibilities, Public Law 94-580. (40 CFR 264.13, 264.75, 264.15, 264.112, 264.73, 264.31, 264.35)

B. Indiana Environmental Management Board, Hazardous Waste Management Permit Program and Related Hazardous Waste Management Requirements, 320 IAC 4.1-15 through 4.1-32.

C. AR 420-47, Chapter 6; AMC HAZMIN Plan, 40 CFR 264.73; AR 200-1, Chapter 8;

D. U.S. Department of Transportation Hazardous Materials Regulations, Title 49 Code of Federal Regulations.

E. U.S. Army Environmental Hygiene Agency, Hazardous Waste Management Technical Guide No. 136, April 1984.

F. U.S. Army Environmental Hygiene Agency Hazardous Waste Management Survey of Jefferson Proving Ground, 10-12 September 1984.

3. RESPONSIBILITIES:

A. Installation Commander:

Ensure all personnel involved in an operation that generates a hazardous waste are fully aware and knowledgeable of the requirements and procedures set forth in this HWMP.

B. Hazardous Waste Program Manager:

The Environmental Coordinator will be designated to be the hazardous waste program manager operate the hazardous waste management program with emphasis on complying with the Federal, State and Army regulations. It is the manager's resposiblity to resolve all hazardous waste problems and oversee installation-wide implementation and to keep the hazardous waste program in comliance with the EPA requirements.

C. Hazardous Waste Management Board:

The members of the management board shall include:

Environmental Engineer
Hazardous Waste Manager
Bldg. 108
(812) 273-7285

Director of Engineering & Housing
Bldg. 108
(812) 273-7284

Fire Protection Division
Bldg. 125
(812) 273-7540

Safety and Health Officer
Bldg. 100
(812) 273-7257

Defense Reutilization &
Marketing Officer

Chief, Supply Services &
Transportation

Bldg. 189
(812) 273-7510/7337

Bldg. 108A
(812) 273-7228

Occupational Health Nurse
Bldg. 33
(812) 273-7330

The hazardous waster management board's responsibilities shall be:

A. To assist the Hazardous Waste Manager in managing the hazardous waste program.

B. To plan, resolve, and coordinate on-post recycling and disposal programs.

C. To review the purchase of hazardous materials with emphasis on consevation, recycling, and the use of alternative materials.

D. To make hazardous materials managment recommendations related to health, safety, or environmental considerations.

4. <u>HAZARDOUS MATERIAL AND WASTE FACILITIES ON JPG:</u>

Table 1 presents a list of hazardous material and hazardous waste facilities currently in operation on the installation. A few of them are not in active state. Description , material/waste stored or used, total capacity/quantity and current status are summarized for each facility.

5. <u>HAZARDOUS WASTES AND DISPOSAL METHODS:</u>

Table 2 presents JPG hazardous wastes, and their EPA RCRA code, annual amount, and source operation, and management method currently used. JPG has small quantity generator status (100kg/month), and holds RCRA Part 265 Part A permit to conduct its open burning/open detonation operations and hazardous waste storage (temporary storage) operation in Bldg. 305. Refer to Table 1 & 2 for details. Table 2 has also described EPA defined non-hazardous wastes, used motor oil, PCB containing transformers, asbestos containing materials (ACM), PCP-treated wood, and barium sulfate/petroleum wax waste.

6. <u>TREATMENT/STORAGE/DISPOSAL FACILITIES ON JPG:</u>

Treatment Facility: JPG has two treatment facilities, the open burning metal pans in the southeast corner, and open detonation ground at "Shonk Farm" in the north of the installation. The open burning of excess and unserviceable propellants and explosive powders is performed in the iron pans. The residue ash from the pans is collected, analyzed and disposed of on the on-site landfill. The residue ash has been analyzed for the RCRA characteristics and determined to be solid waste.

The open detonation of pyrotechnics including fuzes, and grenades is performed on open ground which is cleared of vegetation. Soil samples analysis indicated no heavy metal contamination. Periodic analysis will be conducted to ensure that no heavy metal contamination accumulates in the surface soil or ground water. The state of Indiana Department of Environmental Management issues approved variance from Indiana Administrative Code

325 IAC 4-1 to be renewed annually JPG is required to operate these two facilities in compliance with the variance requirements and specific weather conditions and numerical limitations on the amount burned.

Storage Facility: Building 305 is the hazardous waste storage facility at JPG. The wastes are stored temporarily until they war transported to an off-site treatment facility; or thermally treated on-site in the Bldg. 333 - thermal incinerator with after burner facility. The Bldg. 305 was renovated in 1984 to meet 40 CFR 265, subpart B conforming storage requirements.

The treatment and storage facilities are operated under 40 CFR 265 Part A permitted interim status.

7. WASTE ANALYSIS PLAN:

Jefferson Proving Ground performs no in-house analytical work. The onsite wet chemistry laboratory performs basic BOD, Fecal coliform, PH, temperature, total suspended solids, chlorine residual analysis. The laboratory is located at the on-site sewage treatment plant. All RCRA, Asbestos, PCB, ground-waters analyses are performed off-post by certified private laboratories and/or by Department of the Army laboratories. Any waste suspended of being hazardous by RCRA characteristics, igitability, reactivity, corrosivity, and EP toxicity for eight basic metals, solvents and pesticide ingredients or listed among EPA 40 CFR Part 260-265 chemicals list are sampled and analyzed. If the analysis indicate that the waste is EPA RCRA hazardous, its storage treatment and disposal are carried out in compliance with RCRA requirements.

Table 3 presents waste analysis plan, including hazardous waste, EPA RCRA Code, annual amount and source and analysis employed for appropriate disposal.

7.1 Open Burning/Open Detonation (OB/OD) Grounds

A. Items destined for OB/OD: Laboratory analysis of these items is not feasible because of the danger of explosion. However, detailed chemical analyses may be obtained from "Military Explosives and Propellants Study Guide", from the AMC AMmunition School, Savanna, Illinois. For additional information, see DA Technical Manual 9-1300-214, "Military Explosives".

B. Residues from OB/OD Grounds:

(1) Parameters for Analysis: Residue samples will be analyzed for arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, explosives (e.g., DNT, TNT, HMX, RDX, and Tetryl), and other parameters to assure the residue is not a hazardous waste. The analyses for items burned or detonated can serve as a guide for the content of the residue.

(2) Test Methods: Samples will be analyzed in accordance with the test methods described in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods". appropriate methods of analysis for each chemical, as described in this text, are specified in 40 CFR 261, Appendix III.

(3) Representative Sampling: Samples for analysis will be collected in accordance with ASTM Standard D1452-65 (for soil-like material) or ASTM Standard D420-69 (for soil or rock-like material) are required in 40 CFR 261, Appendix I.

(4) Sampling Frequency: All residues bags will be sampled and analyzed before their disposal on the on-site Gate 19 landfill.

(5) Recordkeeping: Results of analyses for OB/OD residues from each ground will be retained in the office of the Environmental Engineer until each facility is completely closed.

8. TRAINING PLAN:

Jefferson Proving Ground's training plan is summarized in Table 4. The training plan covers three major areas.

A. Hazardous materials(HM) and Hazardous Wastes(HW).

B. HM/HW Spill Emergency Response

C. Asbestos Control/Abatement, removal and disposal.

The installation Environmental Engineer coordinated with JPG management in establishing and implementing training programs in these major areas which are appropriate for their division personnel. The Environmental Engineer is planning to arrange on-site hazardous materials handling training for the personnel in Bldgs 211, 186, 227, 506, 108A, 119, 106, and 208 individual operations. The Environmental Engineer is scheduled for U.S. Army conducted Defense Hazardous Materials Handling training. The installation pest applicator is certified in Army conducted training and handling and mixing pesticides formulations in Bldg. 204. The sewage treatment plant operator is trained in day-to-day operation, analysis and record keeping. The installation radiation control program officer is trained in handling Depleted Uranium (DU) rounds firing, other radioactive sources, and sampling/monitoring program for radiation exposure/dosage.

Appendix A summarizes the training records of Fire Protection Division and Demilitarizations Branch personnel.

9. HAZMIN PLAN (HAZARDOUS WASTE MINIMIZATION PLAN):

Table 5 summarizes existing or proposed initiatives and special facilities needed to support the Congress-mandated HAZMIN plan.

9.1 Management Practices and Suggested Improvements:

As a result of the survey by the Army Environmental Hygiene Agency (AEHA), 10-12 September 1984, may improvements were suggested. Steps have been taken to substitute, minimize, reuse, recover, and recycle hazardous materials or wastes in a more efficient manner.

The existing management controls at JPG are:

A. Substitution of "Roundup" for the herbicide, parquet is implemented. Roundup is biodegradable and is less hazardous to the environment.

B. Minimization of the use of bromacil, a herbicide, on impact fields. The herbicide could leach into the streams and cause soil erosion on the impact fields.

C. The sewage sludge is used as a fertilizer for domestic applications. To verify that the sludge is suitable and non-hazardous are a fertilizer, it is currently periodically tested for the presence of heavy metals.

D. The silver metal from JPG's photographic spent solutions is extracted in batch electrolysis process. After an inspection of the photograph shop, it was determined that JPG has one of the best silver recovery processes under Army Material Command (AMC).

E. 1,1,1-Trichloroethone is filtered and reused again and thru its consumption rate is reduced.

F. Instead of permitting any employee to order chemicals, the supple division must obtain the concurrence of the environmental engineer before filling orders. The environmentalist checks to make sure the item on order is needed before allowing its purchase. He may suggest a material that is less harmful to the environment.

Some improvements are required in order to bring hazardous waste management at JPG into compliance with 40 CFR. Improvements suggested are not all regulatory, but add to better management practices. Suggestions have been made by both the AEHA and the environmental staff at JPG; they are:

A. The rates of generation of hazardous wasted should be tracked more closely. This can be accomplished by periodically checking with the inductrioal operations that generate waste.

B. The inventory of hazardous materials and other chemicals should be updated continuously. Users of such materials, will be required to submit a periodic inventory of materials on hand. Users of chemicals are being advised to store just those quantities that can be used in the near future; stockpiling is being discouraged.

C. Methylene chloride, which is used in the inert loading process in Building 211 should be considered for replacement with a less toxic substance.

D. Various buildings, including Building 110 should label all drums clearly so that waste liquids can be correctly segregated and stored.

E. As called for in 40 CFR 265, the storage facility (Building 305) and treatment facility (OB/OD grounds) are inspected regularly. Records will be maintained for three years.

10. <u>INSPECTION PLAN</u>:

The inspection plan describes those items which the owner or operator of a hazardous waste treatment, storage, or disposal (T/S/D) facility must inspect in order to prevent the release of hazardous wastes to the environment. Refer to Table 6 for inspection check-list for HW facility. This plan is also prepared to minimize personnel exposure to health hazards.

Inspections of T/S/D facilities are required by the Resource Conservation and Recovery Act.

A. Location for inspection:

(1) Hazardous Waste(HW) Storage Facility, Building 305.

(2) Open Burning/Open Detonation (OB/OD) Grounds.

B. Items to be inspected:

(1) HW Storage Facility (bldg. 305). Refer to Table 7 for details.

(2) OB/OD Grounds. Refer to Table 8 and 9 for details.

C. Problems to look for during inspection:

(1) HW Storage Facility

(a) Leaking Transformers (B305 also stores PCB items)

(b) Holes in Storage Trays

(c) Leaking Drums

(d) Torn Bags

(2) OB/OD Grounds

(a) Any residue remaining on burning pad

(b) Standing water around pad

D. Frequency of inspections:

All facilities considered as sources for release of hazardous waste to the environment shall be inspected once a week by either the Environmental Coordinator or his Assistant.

E. Inspection Log:

The inspection log, Table 7, shall be filled out each time an inspection is made of one of the facilities.

F. Emergency Response:

If a spill or release to the environment occurs or is encountered during an inspection, the guidelines detailed in the Installation Spill Contingency Plan will be followed.

11. SPILL PREVENTION AND CONTINGENCY PLANS:

Jefferson Proving Ground has in effect both the Spill Prevention, Control, and Countermeasures Plan (SPCC Plan) and Installation Spill Contingency Plan (ISCP). Spills of oil and hazardous substances must be cleaned

up and safety hazardous aborted and reported under both EPA and DOT rules. Plans are updated at least once every 3-years period. or a major change occurs in the installation's testing/evaluation operations and engineering support activities. The ISCP plan is tested every year in a simulated spill scenario. Both the plans are available for information and review at the Environmental Engineer's office and Fire Department.

Table 1: Hazardous Material (HM) and and Hazardous Waste (HW) Facilities

FACILITY DESCRIPTION	MATERIALS STORED/USED	TOTAL CAPACITY QUANTITY	CURRENT STATUS
(1) (Bldg. 602) Heating Plant, 2 Underground storage tanks, 25,000 gallon ea.	Fuel Oil #2	50,000 gal	Not Active (Resumption under planning stage)
(2) (Bldg. 617) Heating Plant, 2 underground storage tanks, 25,000 gallons each	Fuel Oil #2	50,000 gal	Not Active
(3) (Bldgs. 303 (Fuel Oil Dispenser) and 310 (Heating Plant) 3 underground storage tanks,25,000 gallons each	Fuel Oil #2	75,000 gal	Not Active
(4) (Bldg. 118) Loading/Unloading Station (Underground Tanks)			
2 tanks, 12000 gal ea	Unleaded gasoline	24,000 gal	Active
1 tank, 12000 gal ea	Diesel	12,000 gal	Active
1 tank, 25000 gal ea	Fuel Oil #2	25,000 gal	Active
1 tank, 1000 gal ea	Fuel Oil #2	1,000 gal	Active
1 tank, 550 gal ea	Fuel Oil #1	550 gal	Active
1 tank, 1000 gal ea	Leaded Gasoline	1,000 gal	Active
1 tank, 675 gal	Kerosene	675 gal	Active
1 tank, 550 gal	White Gas	550 gal	Active
(5) (Bldg. 103) Central Heating Plant 4 underground tanks, 25,000 gal ea.	Fuel Oil #2	100,000 gal	Active
(6) (Eleven operation/storage areas)			
(Bldg. 177) Sewage Treatment Plant,	Chlorine	180 lbs-900 lbs	Active

Gas cylinders for chlorination			
(Bldg. 506) Degreasing Operation, 2 55-gallon steel drums	1,1,1-Trichloro-ethane	110 gal	Active
(Bldg. 108) 5 5-gal Containers	Ammonia (aqueous)		Active
(Bldg. 108A) 3 enclosed storage areas, 5-gallon plastic containers	Sulfuric Acid	50 gal	Active
	Acetic Acid	50 gal	
	Caustic Soda	50 gal	
	1,1,1-Trichloroethane	110 gal	
	Motor Oil	100 gal	
	Lubricants, and Hydraulic Oil	50 gal	
	Paints, Lacquers	100 gal	
	Thinners	50 gal	
	Photography Fixers, & Developers	100 gal	
(Bldg. 208) Photography Processing Laboratory, Silvery recovery operation, 5-gallon plastic containers	Fixers, Developers	100 gal	Active
	Acetic Acid	25 gal	
(Bldg. 186) Equipment and Vehicle Maintenance, 55-gallon drums,	Stoddard Solvent (Type II)	150 gal used solvent	Active
1200-gal underground storage tank	Used motor oil	1,100 gal used oil	
(Bldg 305) Hazardous Waste Storage 55-gal drums 25-gal drums 10-gal cans 6-mil plastic bags	Spent solvents, PCB containers and trans-formers, organic chemical wastes, asbestos containing insulations	Refer to Appendix C	Active
(Bldg 211) Ammunition Processing Workshop - 55-gal drums	Methylene chloride,	110 gal	Active
	Two chemical mixtures-Polyols and polymeric isocyanates	110 gal	
	Barium sulfate	8,600 lbs	
	Petroleum wax	-	

(Bldg 227) Weapons Maintenance	Stoddard Solvent (Type II) Kerosene Aerosol cans-solvents and thinners	 350 gal 110 gal 10 cans	Active
(Bldg 119) Painting Workshop	Paints, Lacquers Thinners	150 gal 5 gal	Active
(Bldg. 105) Metal Working Workshop	Hydraulic Oil	55 gal	Active
(7) (Bldg. 204) Pesticide Storage Containers	Insecticides and Herbicides	Refer to Table 3	Active
(8) (Open burning/open detonation Facilities) Open burning pans (4) and open detonation ground (Shonk Farm)	To open burn propellants, explosive To open detonate pyrotechnics	Propellants, Explosives 40,000-90,000 lbs Pyrotechnics - 500 lbs	Active

Table 2: Hazardous wastes and Their Disposal Methods

HAZARDOUS WASTE AND RCRA CODE	ANNUAL AMOUNT AND SOURCE	MANAGEMENT METHOD USED
(1) Excess, unserviceable Propellants, Explosives and Pyrotechnics (D001-XASH) Explosion powder, flakes. Not considered RCRA hazardous waste.	126, 631, lb. Propellants, 600 lb. Pyrotechnics Ammunintions for received from outside manufacturing plants.	On-site open burning in metal pans for Propellants and Explosives; and on-site open detonation on open ground for pyrotechnics. Residue ash (600 lb.) analyzed, (determined solid waste) and disposed of on on-site landfill. Open detonation ground analyzed for heavy metal contamination.
(2) Spent 1,1,1-Trichloroethane solvent (F001) Ignitable liquid.	55 gal. Degreasing Operation, Bldg. 506 Temporary storage in Bldg. 305 (HW Storage)	Transported off-post through arrangements with Defense Reutilization Marketing Service. The receiving private facility reclaims the solvent through distillation.
(3) Spent Stoddard Solvent (D001) Ignitable Liquid. Assumed to be not RCRA Waste. Its RCRA characteristics are being analyzed.	110 gal. Degreasing Operation, Bldg. 186, 105, and 227. Temporary storage in Bldg. 305 (HW Storage)	A portion used on-site for fire training. The rest amount transported off-post. The receiving private facility reclaims the solvent through distillation.
(4) Used Motor Oil (D001) Not considered RCRA hazardous waste. Ignitable liquid.	1200 gal. Equipment and vehicle maintenance operation. Stored in underground storage tank.	Transported off-post. The receiving private facility incinerates in a Cement Kiln.
(5) Used Lead-Acid Batteries (D002) Corrosive electrolyte liquid.	1500 lb. (200 Batteries) Equipment and vehicle maintenance operation.	Transported off-post to Defense Reutilization Marketing Service located at Lexington-Blue Grass Army Depot for their disposal.
(6) PCB Transformers (XPB1, XPB2, XPB3) Toxic dielectric fluid with <50ppm, 50-500 and >500 ppm	625 gal(max) with over 80% of the amount containing less than 50 ppm PCB. Transformers taken out from the eletrical service.	The tranformers are transported off-post through DRMS arrangements. The receiving private facility

PCB. Not considered RCRA Hazardous Waste.	Temporary storage in Bldg. 305 (HW Storage)	incinerates in an EPA - incinerator.
(7) Asbestos containing Materials (XASB). Toxic solid. Not considered RCRA hazardous waste.	1100 lbs. Piping insulations, roof shignles, boiler shell insulation, duct insulation. Temporary storage in HW Storage - Bldg. 305.	On-site disposal in the JPG-operated solid fill site.
(8) PCP - Treated Wood Pallets. Not considered RCRA hazardous waste (Not F027 Waste)	1100 lbs. Excess, unserviceable ammunition storage wooden pallets.	Transported off-post and disposed of in a sanitary landfill.
(9) Excess 80% Ba504 20% Parafin Wax Waste (D001, D005). Assumed to be not RCRA hazardous waste, however, its RCRA characteristics are being analyzed for confirmation.	150 gal. Temporary storage in Bldg. 305 - HW Storage, The mixture is used as inert ballistic filler in the inert loading plant - Bldg. 211.	The disposal method is being determined. If it characterized as a as a solid waste, it be disposed of the on-site solid fill site.
(10) Excess mixture of Aromatic isocyanate, pilyether polyol and iron oxide. (D001) Ignitable solid. Assumed to be not RCRA waste. Its RCRA characterisitics are being analyzed.	150 gal. Temporary Storage in Bldg. 305 - HW Storage The mixture is used as inert ballistic filler in the inert loading plant Bldg. 211.	On-site high temperature incineration. Single chamber incinerator with after burner. Fuel oil #2 is used as heat supply. The iron oxide-containing ash is analyzed before disposal on the on-site solid fill site.
(11) Spent Methylene Chloride Solvent. (F001) Ignitable liquid. Highly volatile. Boiling point 104 F.	110 gal. Cleaning the components of the mixing equipments used in Bldg 211 - Inert loading plant to mix aromatic isocyanate with poluether polyol.	100% emission due to its vaporization during the cleaning operation. Not revovered presently.
(12) Papers, cloth Rags with 5% weight "CARC" Paint residue (D001, U226) Aliphatic Polyurethane coating lead and Chromate free, and epoxy polyamide and aliphatic polyisocyanate. Assumed to be Not	One 25-gal fiber drum per month. Maximum ten drums per year. Temporary storage in Bldg. 305 - HW Storage/	On-site high temperature incineration under consideration. Single chamber incinerator with afterburner.

RCRA characteristics
are being analyzed.

Table 4: Training Plan

Hazardous Waste Area	training Program Used	Personnel/Division for Training
(1) Hazardous Material (HM) and Hazardous Wastes (HW) handling	(a) US Army conducted training in Ammunition Demilitarization, Ammunition destruction and surveillance, explosive ordnance disposal, and decontaminated explosives. (b) US Army conducted training in Technical Transportation of Hazardous Materials Course (MTMC-2) and and General Transportation of Hazarous Material Course (MTMC-1). (c) Certification in Pesticides Application - US Army conducted program. (d) OSHA - Hazardous Communication Standard - Material Safety Data Sheet, Local Occupational Health Hazard Inventory.	RANGE SUPPORT BRANCH. (Explosive Demiliterization Branch) Personnel Transportation Officier and Receiving Division personnel. Bldg 211 - Inert Loading Plant Bldg 186 - Equipment Maintenance Bldg 227 - Weapons Maintenance Bldg 506 - Degreasing Operation Bldg 305 - HW Storage Bldg 208 - Photoprocessing and Silver recovery Bldg 204 - Pesticides Storage
(2) HM/HW Spill Emergancy Response Training	US EPA Sponsored Training in hazardous materials spill response; Annual testing of the Installation Spill Contingency Plan (ISCP)	Fire Protection Division Personnel, Environmental Engineer
(3) Asbestos Removal and Disposal	US EPA sponsored training in asbestos abatement projects: course and workshop; inspecting building for asbestos - containing materials; managing asbestos in buildings.	Building, and Utility Division Personnel; Environmental Engineer (Asbestos Co-ordinator)

Table 5: Hazardous Waste Minimization Plan

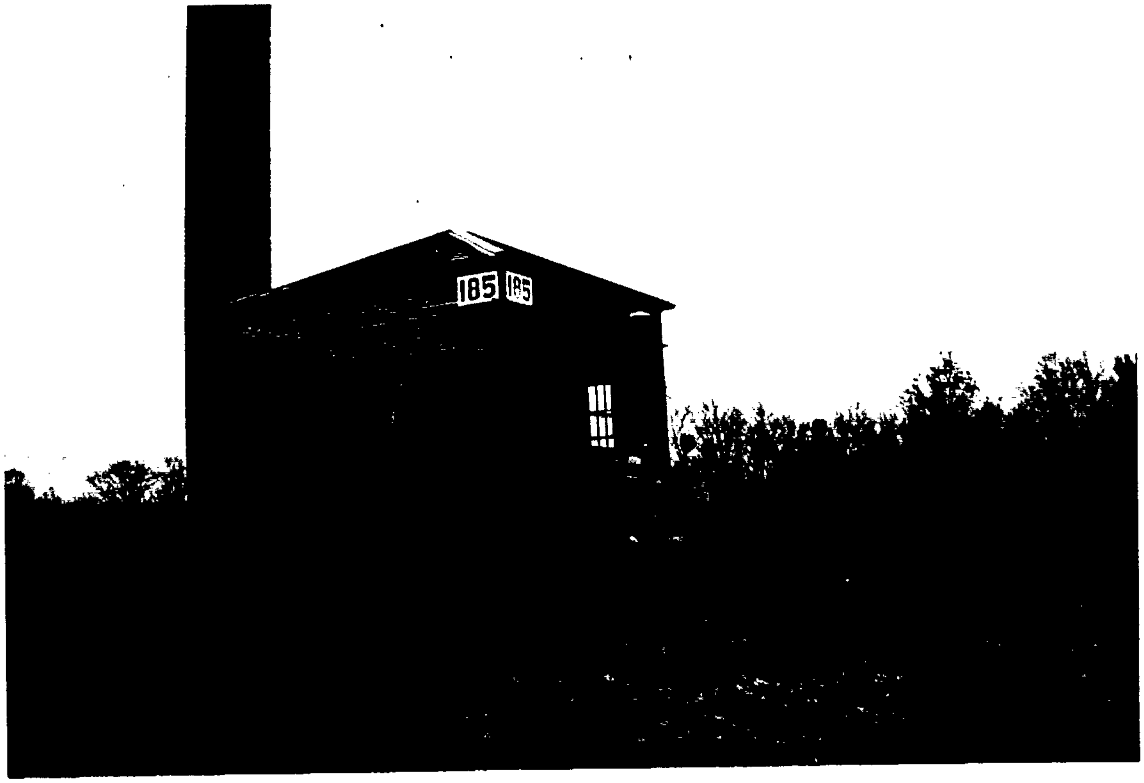
WASTE AND EPA CODE	ANNUAL AMOUNT	MINIMIZATION PLAN
(1) Spent 1,1,1-Trichlorothehane Solvent. RCRA Waste (F001)	110 gal	Reclamation by batch wise Thermal or vacuum distillation is in planning stage. Distillation still is to be purchased. The budget has already been approved.
(2) Spent Stoddard Solvent (NSN 6850-00-264-9039) (Petroleum Distillate) (Flash Point 140 F) (D001)		A portion is used for local Fire Training. The remaining amount if planned to be used as auxiliary fuel in Bldg. 333 - Incinerator to incinerate a small amount of polyether waste
(3) Used Motor Oil. Non-RCRA waste.	1200 gal	Burning on-site in an utility boiler is in planning stage.
(4) Excess mixture of Aromatic Isocyanate and Polyether Polyol and iron oxide. Non-RCRA waste.	150 gal	On-site incineration. Bldg 333 is single hearth incinerator with afterburner. Fuel oil #2 is used as heat source for incineration. Waste Stoddard Colvent (Type II) and used oil.
(5) Papers, cloth rags with 5% "CARC" paint residue. The paint is mixture of apiphatic polyurethane and epoxy polyamide and aliphatic polyisocyanate	10 25-gal fiber drum 5% paint residue, 95% cloth, paper	On-site high temperature incineration under consideration. Single chamber incinerator with afterburner.
(6) Spent Methylene chloride RCRA waste (F001). Highly volatile, boiling point 104 F	110 gal, (1200 lbs)	Substitution with low volatile, high flash point solvent.

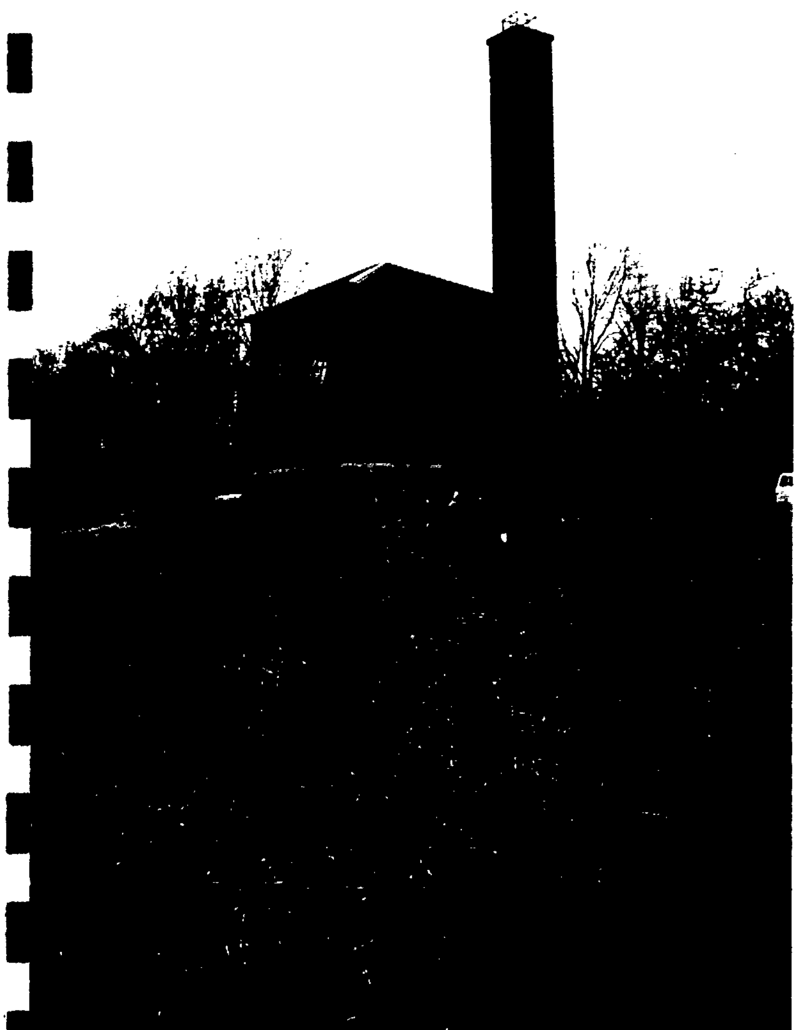
Table 6: Inspection Check-list for HW Storage Facility

ITEM	Type of PROBLEM
1. Tank	Deterioration of concrete, cracks, spalling, leaks, tank level.
2. Tank Liner/ coating	Damage, punctures, tears.
3. Leak Detectors	Damage to equipment, malfunctioning.
4. Tank Cover	Damage to steel wire mesh, holes, excessive, corrosion.
5. Earth Dike	Damage to dike, excessive erosion, sloughing, settlement.
6. Tank Leak Detector System	Damage to observation well covers, ladder to access observation wells.
7. Training Records	Missing or incomplete.
8. Inspection Records	Missing or incomplete.
9. Alarm/Communication System	Not operational, missing.
10. Containers	Deterioration, corrosion, leaks, improperly sealed.
11. Containers placements	Insufficient isle space, numbers of containers exceed quantity limits, containers not properly placed on pallets, damaged pallets. Deterioration of concrete, walls, floors, roof, curbs, ramps, etc.
12. Containers	Labeling or identification of containers not clear, or damaged.
13. Security	Damage to locks or doors, gates, signs, fence, missing property.
14. Fire extinguisher	Not fully charged, missed.
15. Water source and hose	Not operational, removed from designated location
16. Absorbents and recovery drums	Out of Stock.
17. Signs	Insufficient number, improper wording.
18. Material Handling Equipment	Non-operable, not available.
19. Shower/eye Wash	Non-operable.

20. Protective equipment, face, shields aprons, gloves, respir- ators	Not available, poor condition.
21. Odors/fumes detected or observed	
22. Other	Any other noted potential or existing deficiencies.
23. Persons presents:	Name, Title, organization and phone numbers.

APPENDIX 3
PHOTOGRAPHS

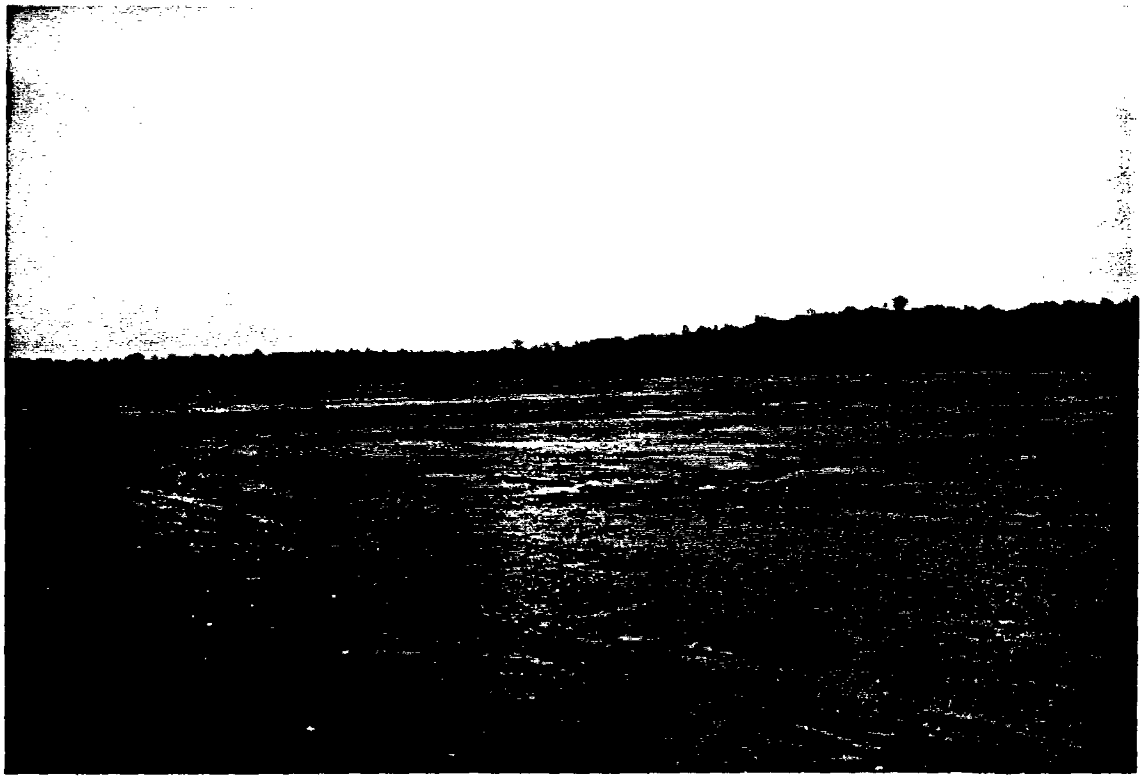




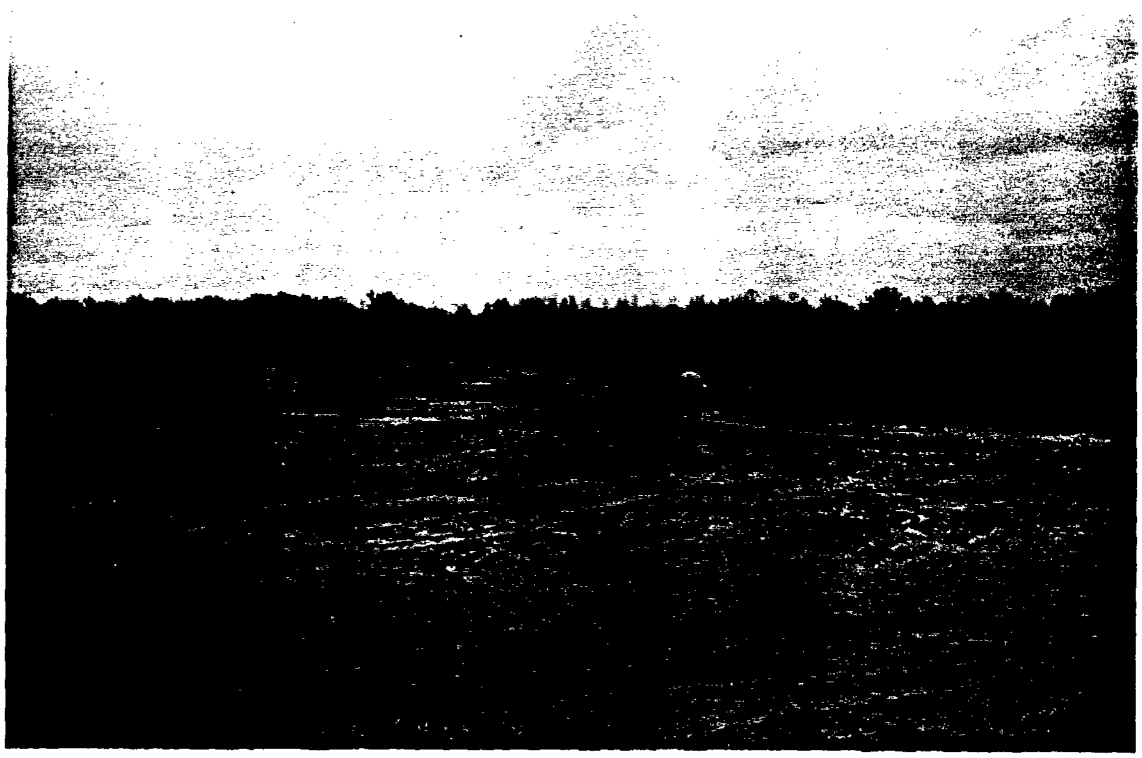
JPG-001 OLD INCINERATOR; 11/15/89

JPG-003 SEWAGE TREATMENT PLANT - Trickling Filter; 11/15/89

JPG-003 SEWAGE TREATMENT PLANT - Sludge Drying Beds; 11/15/89



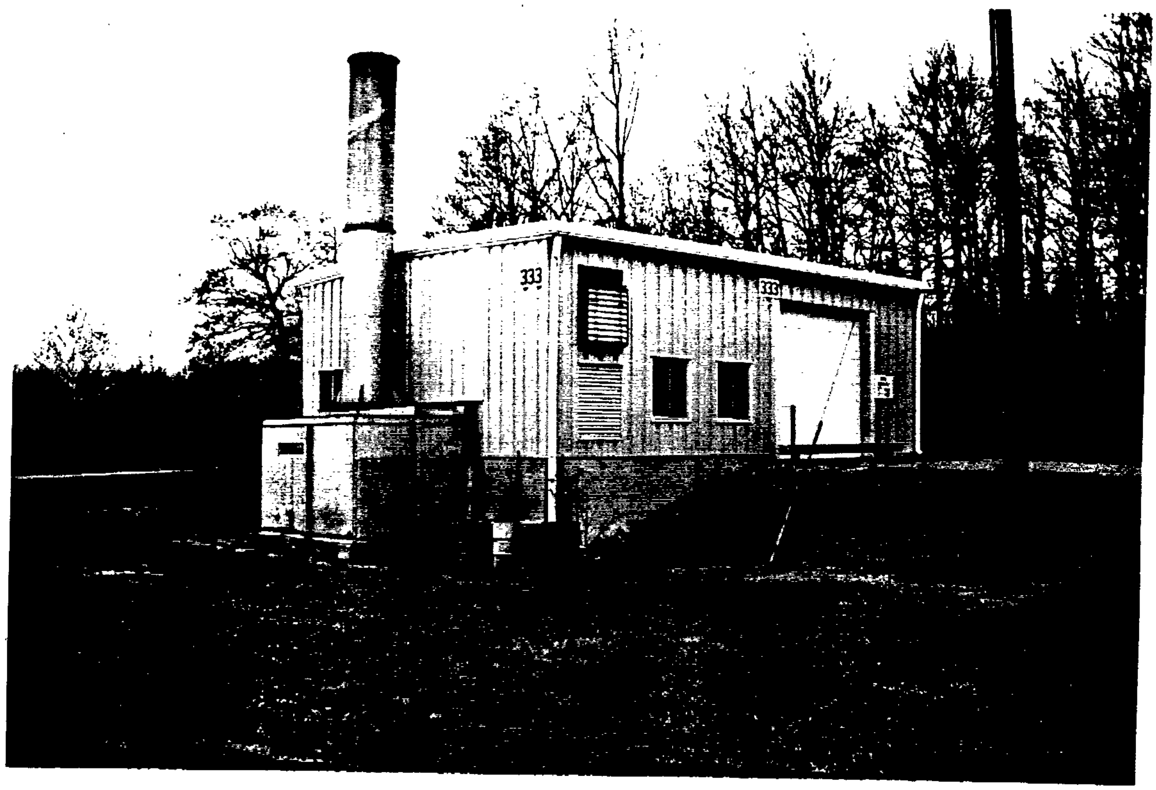
16,000 E IMPACT AREA; 11/14/89



JPG-006 - Dry creekbed; 11/14/89

WOOD PILE - At airport from hangar, facing west; 11/15/89

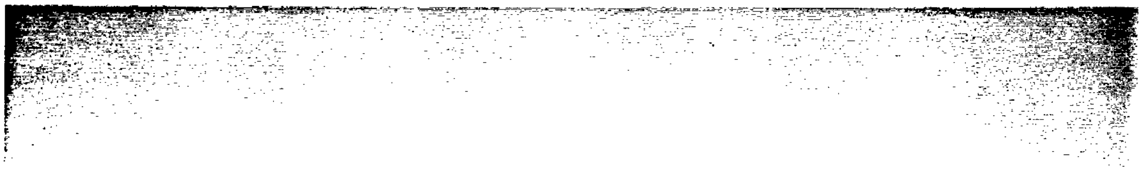
JPG-008 TREATED WOOD STORAGE AREA; 11/15/89



JPG-011 (BLDG. 333) NEW INCINERATOR - Drums of waste oil; 11/15/89

JPG-015 GATE 19 LANDFILL; 11/13/89

POND S. OF JPG-015 - SW of burning ground; 11/13/89



JPG-015 GATE 19 LANDFILL - Facing N; 11/13/89

JPG-015 GATE 19 LANDFILL - Facing E; 11/13/89

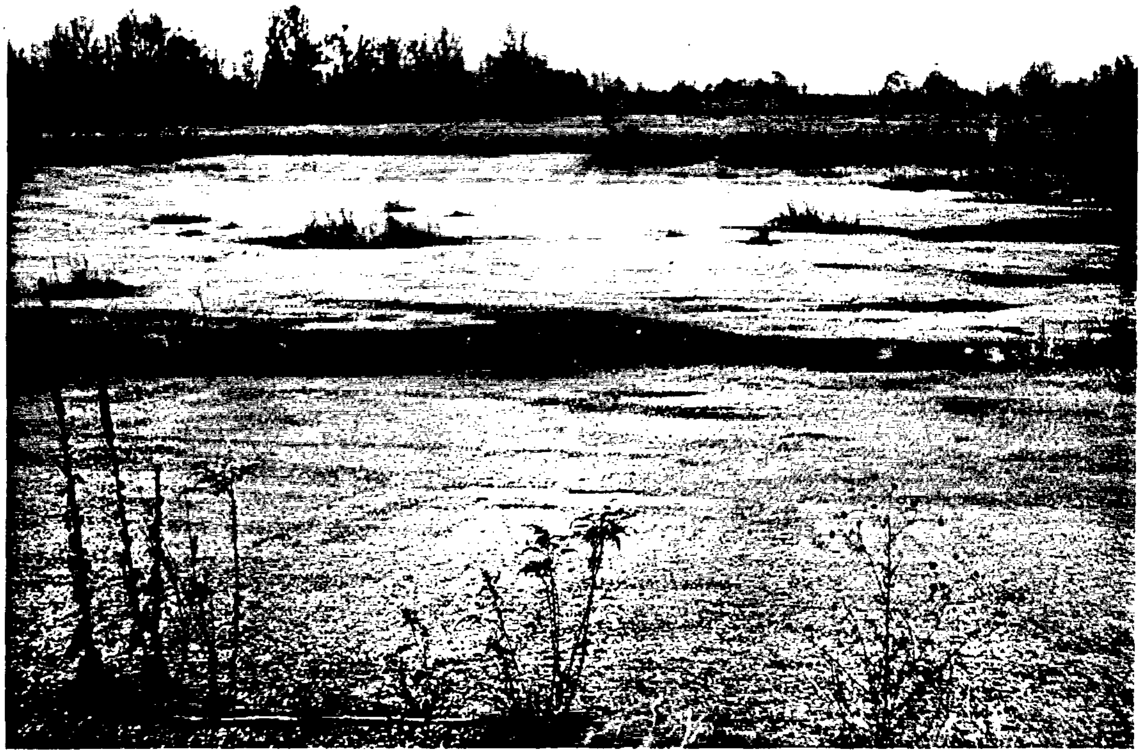
JPG-016 ORDNANCE DISPOSAL SITE; 11/14/89

JPG-016 ORDNANCE DISPOSAL SITE - Pit filled w/water; 11/14/89

JPG-017 LANDFILL - Inert ammunition; 11/14/89

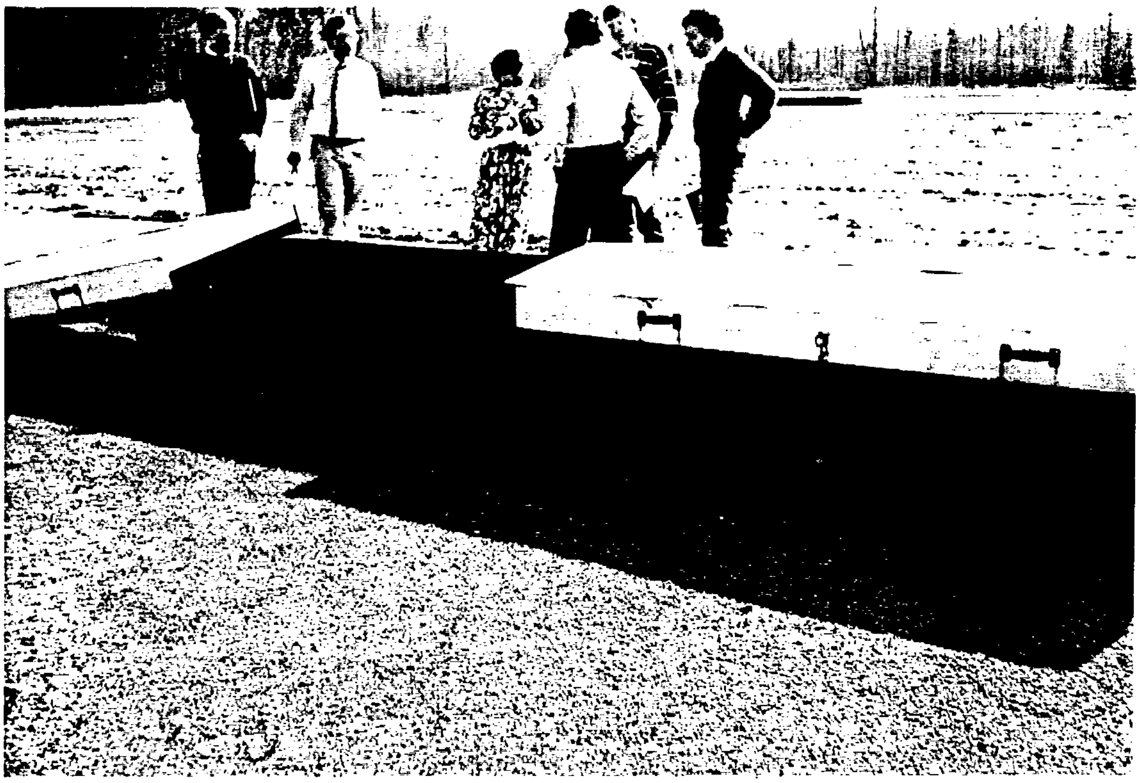
JPG-018 ABANDONED WELL DISPOSAL SITE; 11/14/89

JPG-019 SEDIMENT BOTTOM TEST POND - Facing West; 11/14/89



JPG-020 MACADAM TEST POND; 11/14/89

JPG-020 MACADAM TEST POND; 11/14/89



JPG-022 - Burning trays; 11/13/89

JPG-022 - Residue in burning trays; 11/13/89

JPG-023 - Recent open detonation crater; 11/14/89

JPG-023 OPEN DETONATION AREA - sinkhole, old crater; 11/14/89

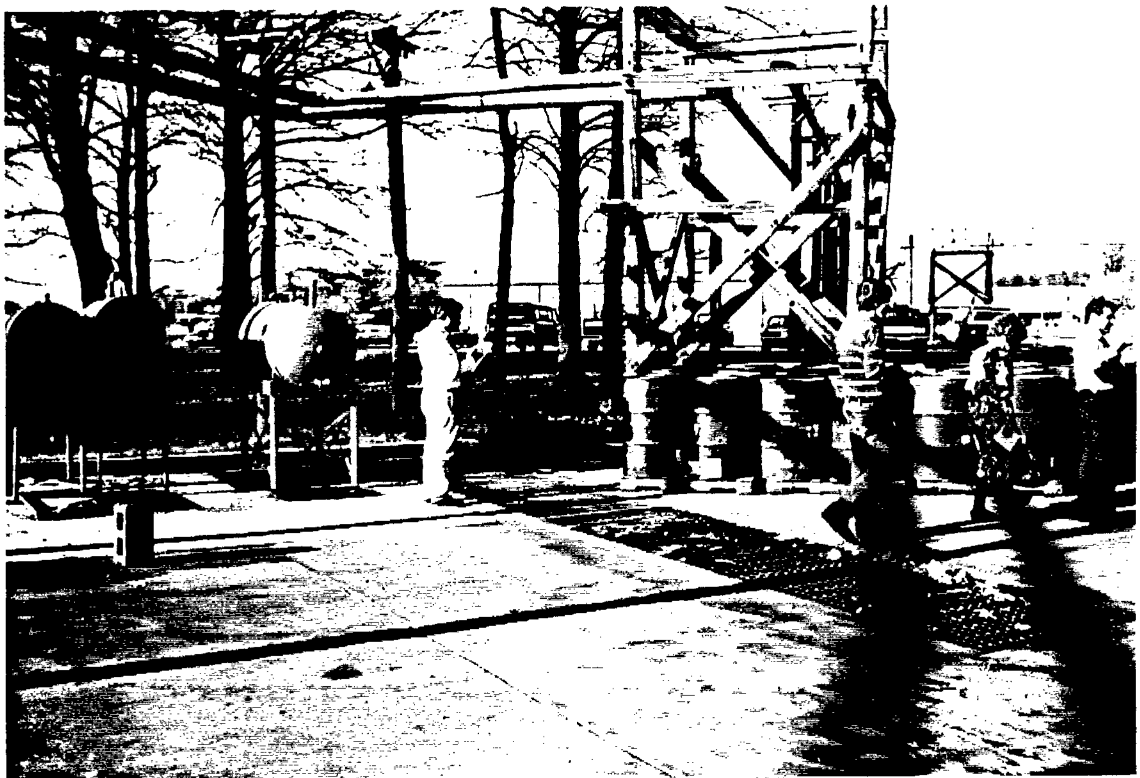
JPG-024, JPG-025 - Ponded water; 11/14/89

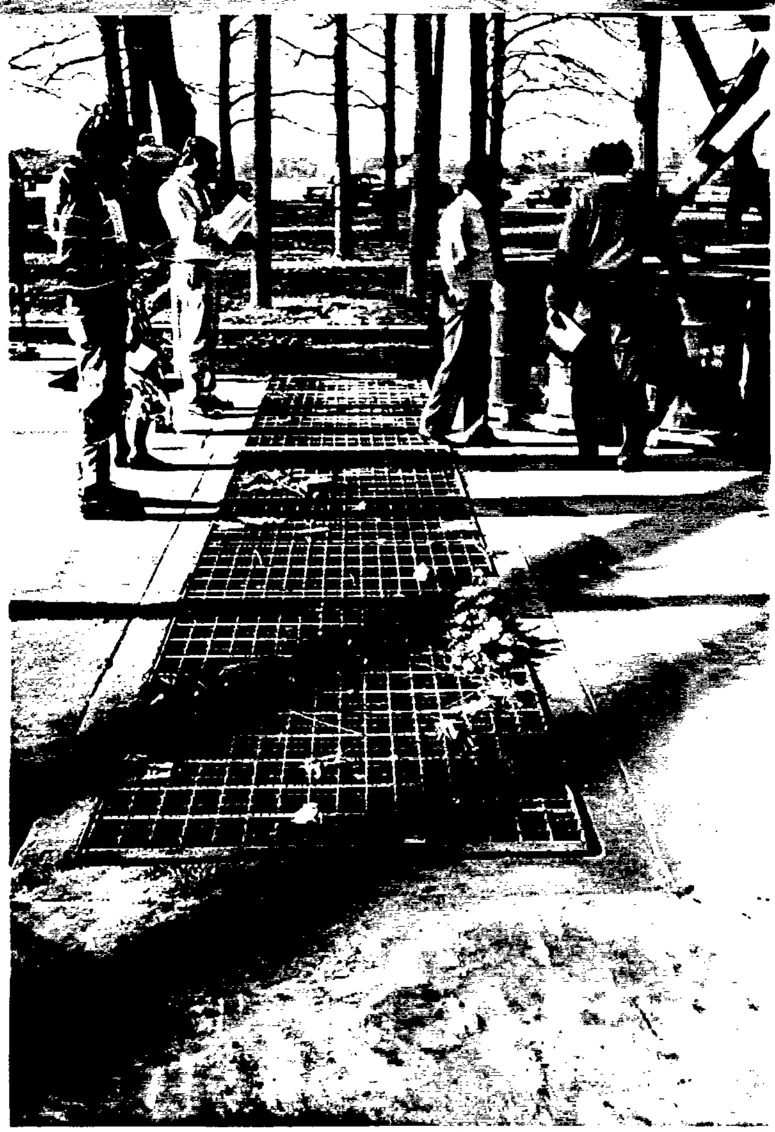
JPG-024, JPG-025 - Target facing North; 11/14/89

JPG-026 - Landfill area below dam; 11/14/89

JPG-027 BUILDING 602 SOLVENT DISPOSAL AREA; 11/13/89

BUILDING 186 MAINTENANCE GARAGE - Oil separator pit; 11/13/89

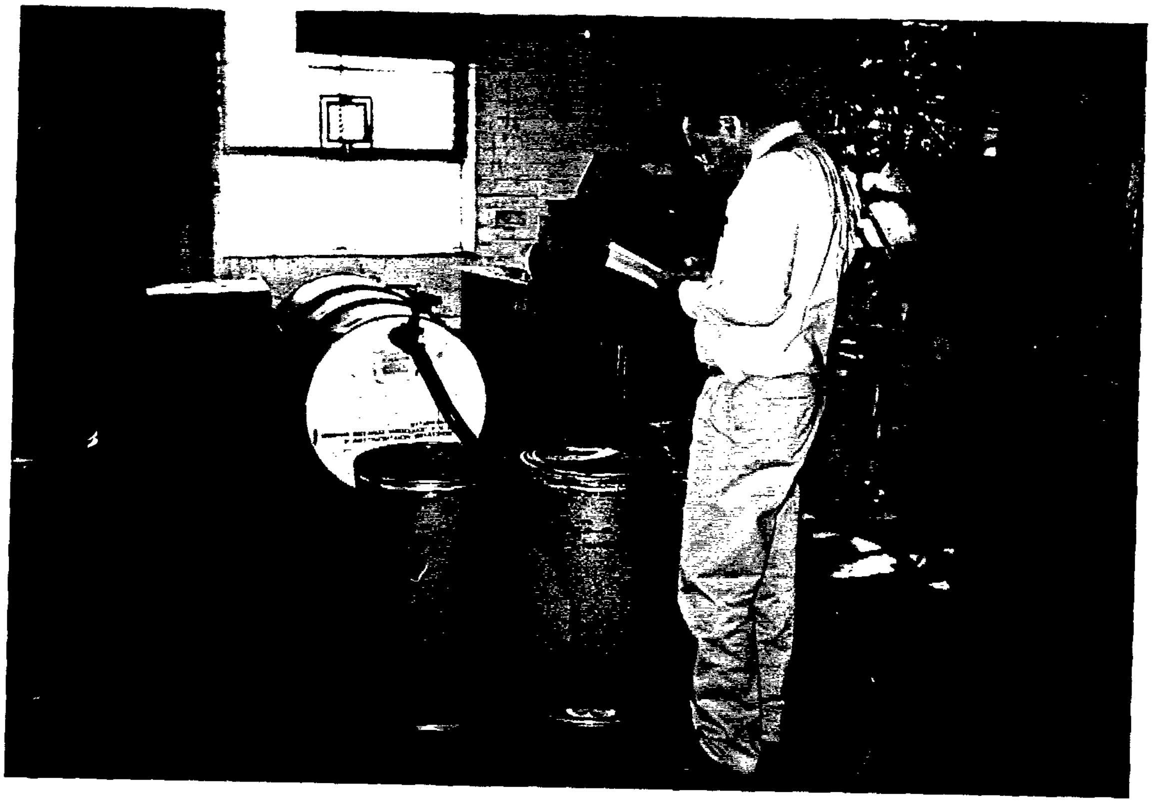




BUILDING 186 MAINTENANCE GARAGE - Tanks, empty drums; 11/13/89

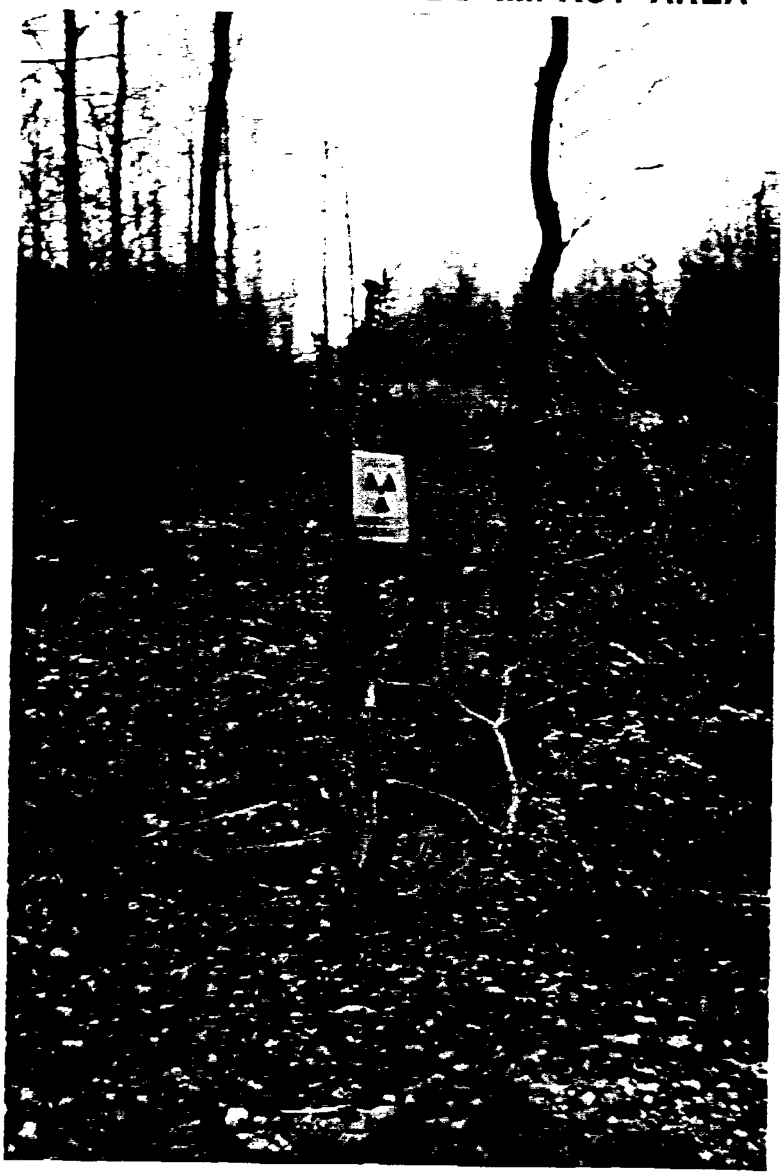
JPG-029 BUILDING 279 SOLVENT DISPOSAL AREA - MW15; 11/13/89

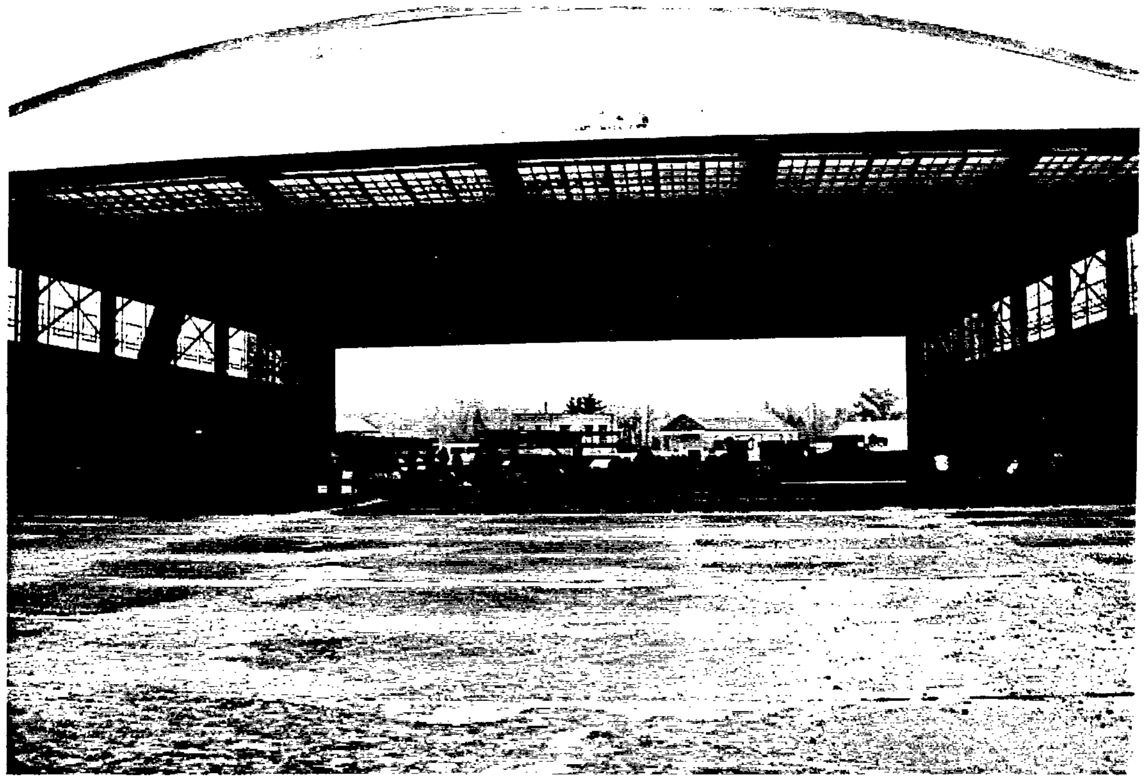
JPG-028 BUILDING 617 SOLVENT DISPOSAL AREA; 11/13/89



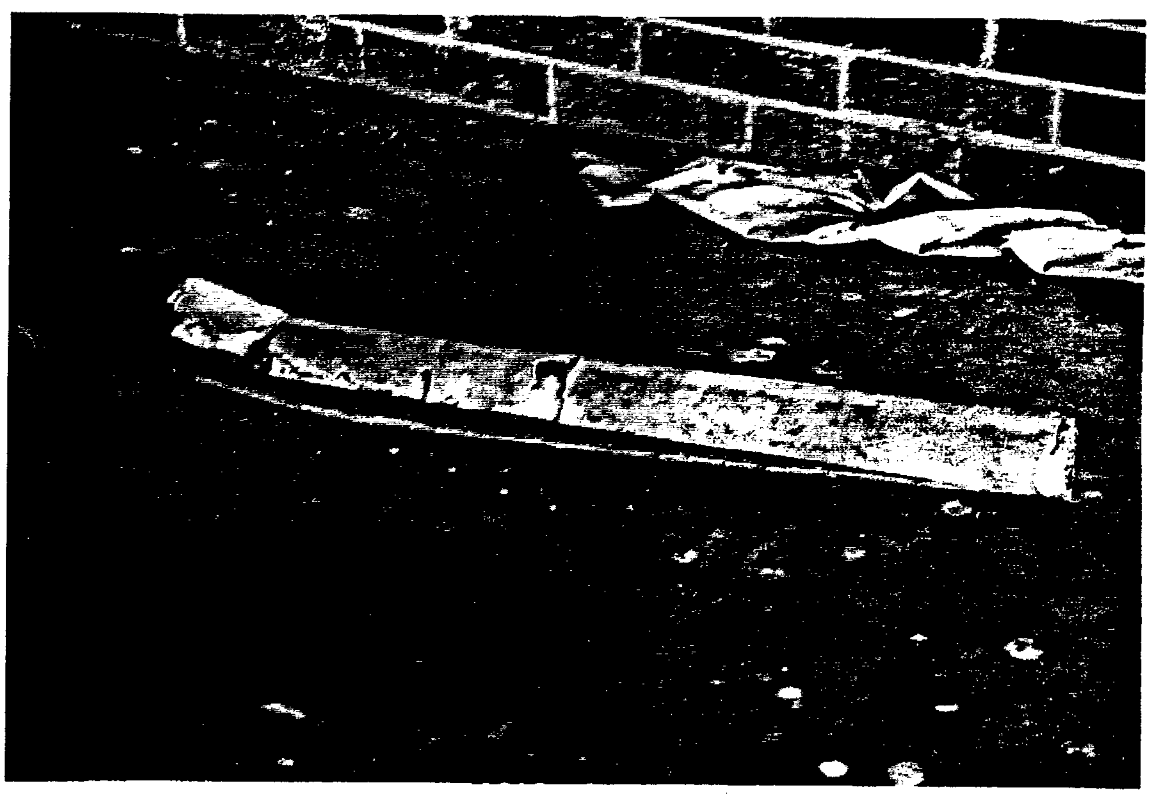
BUILDING 211 - Inert loading building; 11/13/89

DU IMPACT AREA - Facing NNE; 11/14/89





HANGAR - Asbestos pipe insulation on floor; E. wall of main area; 11/15/89



HANGAR - Facing North; 11/15/89

SULFUR PILE -Disposal area; 11/15/89

BURNED AREA - S. of the New Incinerator; 11/15/89

APPENDIX 4
ANALYTICAL REPORTS FROM THE SEWAGE TREATMENT PLANT

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Professional Laboratory Services

Laboratory Report

Date 07/17/89 Page 1 of 1

Lab Control No. 89,796

P. O. Number DAAD0389M05313 Job No. 007137

Sample Source
US Army Jefferson Proving Grnd
Commander
Attn: STEJP-EH (K. Joshi)
Madison, IN 47250-5100
Attn: Mr. Kaushik N. Joshi

Bill To
FINANCE ACCT. OFFICER Attn: STEJP-RM-F
Madison, IN 47250-0000

Sample Description: Wastewater | Sample Type: COMPOSITE | Location: Sewage plant effluent

Date Collected: 06/27/89 | Date Received: 06/30/89 | Collected By: Client | Time of Collection: 00:00

Parameter	Results	Date Analyzed	Analyst	Method of Analysis
Ammonia nitrogen	0.60 mg/l	07/07/89	Rogers	Distillation Nesslerization
Cyanide, total (CN)	<0.005 mg/l	07/10/89	Young	Distillation/ Colorimetric
Silver, total	0.013 mg/l	07/06/89	Isler	Flame atomic abs.

Remarks

State Certification No. M-10-1

Analysis Reviewed By [signature]

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Laboratory Report

Date 07/19/89 Page 1 of 1

Lab Control No 90,217 thru 90,219

P. O. Number

Job No 007137

Sample Source
US Army Jefferson Proving Grnd
Commander
Attn: STEJP-EH (K. Joshi)
Madison, IN 47250-5100
Attn: Mr. Kaushik N. Joshi

Bill To
FINANCE ACCT. OFFICER Attn: STEJP-RM-F
Madison, IN 47250-0000

Sample Description: Sewage Plant Effluent | Sample Type: 24 HR COMPOSITE | Location: Sample identification given below

Date Collected: 07/06/89 | Date Received: 07/07/89 | Collected By: Client | Time of Collection: 00:00

Parameter	Results	Date Analyzed	Analyst	Method of Analysis
E.C.I. #90,217				
Sample #2A				
Ammonia nitrogen	<0.10 mg/l	07/13/89	Rogers	Distillation Nesslerization
E.C.I. #90,218				
Sample #2C				
Cyanide, total (CN)	<0.005 mg/l	07/13/89	Young	Distillation/ Colorimetric
E.C.I. #90,219				
Sample #2S				
Silver, total	0.009 mg/l	07/13/89	Isler	Flame atomic abs.

Remarks

State Certification No. M-10-1

Analysis Reviewed By [signature]

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Environmental Consultants

Professional Laboratory Services

Laboratory Report

Date 07/21/89 Page 1 of 1

Lab Control No. 90,608 thru 90,610

P.O Number Job No 007137

Sample Source
US Army Jefferson Proving Grnd
Commander
Attn: STEJP-EH (K. Joshi)
Madison, IN 47250-5100
Attn: Mr. Kaushik N. Joshi

Bill To
FINANCE ACCT. OFFICER Attn: STEJP-RM-F
Madison, IN 47250-0000

Sample Description	Sample Type	Location
Wastewater	24 HR COMPOSITE	Sample identification given below

Date Collected	Date Received	Collected By	Time of Collection
07/89	07/13/89	Client	00:00

Parameter	Results	Date Analyzed	Analyst	Method of Analysis
E.C.I. #90,608				
Plant Effluent #3C				
Cyanide, total (CN)	<0.005 mg/l	07/14/89	Young	Distillation/ Colorimetric
E.C.I. #90,609				
Plant Effluent #3N				
Ammonia nitrogen	<0.10 mg/l	07/13/89	Rogers	Distillation Nesslerization
E.C.I. #90,610				
Plant Effluent #3S				
Silver, total	0.004 mg/l	07/19/89	Isler	Flame atomic abs.

Remarks

State Certification No. M-10-1

Analysis Reviewed By

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Environmental Consultants
Professional Laboratory Services

Laboratory Report

Date 07/28/89 Page 1 of 1

Lab Control No 90,975 thru 90,977

P.O Number 89-M-0532 Job No 007137

Sample Source
US Army Jefferson Proving Grnd
Commander
Attn: STEJP-EH (K. Joshi)
Madison, IN 47250-5100
Attn: Mr. Kaushik N. Joshi

Bill To
FINANCE ACCT. OFFICER Attn: STEJP-RM-F
Madison, IN 47250-0000

Sample Description	Sample Type	Location
Wastewater	GRAB	Sample identification given below

Date Collected	Date Received	Collected By	Time of Collection
07-19-89	07/20/89	Client	00:00

Parameter	Results	Date Analyzed	Analyst	Method of Analysis
E.C.I. #90,975 4A-Sewage Treatment Plant Ammonia nitrogen	<0.40 mg/l	07/20/89	Rogers	Distillation Nesslerization
E.C.I. #90,976 4C-Sewage Treatment Plant Cyanide, total (CN)	0.007 mg/l	07/20/89	Young	Distillation/ Colorimetric
E.C.I. #90,977 4S-Sewage Treatment Plant Silver, total	0.008 mg/l	07/24/89	Isler	Flame atomic abs.

Remarks

State Certification No. M-10-1

Analysis Reviewed By [signature]

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Laboratory Report

Date 08/08/89 Page 1 of 1

Lab Control No. 91,353 thru 91,355

P.O. Number 89-M-0532 Job No. 007137

Sample Source
US Army Jefferson Proving Grnd
Commander
Attn: STEJP-EH (K. Joshi)
Madison, IN 47250-5100
Attn: Mr. Kaushik N. Joshi

Bill To: FINANCE ACCT. OFFICER Attn: STEJP-RM-F
Madison, IN 47250-0000

Sample Description	Sample Type	Location
Wastewater	24 HR COMPOSITE	Sample identification given below

Date Collected	Date Received	Collected By	Time of Collection
07/26/89	07/27/89	Client	00:00

Parameter	Results	Date Analyzed	Analyst	Method of Analysis
E.C.I. #91,353				
5(A)				
Ammonia nitrogen	<0.40 mg/l	07/27/89	Rogers	Distillation Nesslerization
E.C.I. #91,354				
5(C)				
Cyanide, total (CN)	0.008 mg/l	07/31/89	Young	Distillation/ Colorimetric
E.C.I. #91,355				
5(S)				
Silver, total	0.007 mg/l	08/01/89	Isler	Flame atomic abs.

Remarks

State Certification No. M-10-1

Analysis Reviewed By Sarah Rogers

ORIGINAL

ENVIRONMENTAL CONSULTANTS, INC.
391 Newman Avenue • Clarksville, Indiana 47130 • Phone (812) 282-8481

Environmental Consultants

Professional Laboratory Services

Laboratory Report

Date 08/24/89 Page 1 of 1

Lab Control No. 92,136 thru 92,138

P.O. Number

Job No. 007137

Sample Source
US Army Jefferson Proving Grnd
Commander
Attn: STEJP-EH (K. Joshi)
Madison, IN 47250-5100
Attn: Mr. Kaushik N. Joshi

Bill To:
FINANCE ACCT. OFFICER
Attn: STEJP-RM-F
Madison, IN 47250-0000

Sample Description	Sample Type	Location
Wastewater	24 HR COMPOSITE	Sample identification given below

Date Collected	Date Received	Collected By	Time of Collection
08-09-89	08/10/89	Client	00:00

Parameter	Results	Date Analyzed	Analyst	Method of Analysis
E.C.I. #92,136				
Sample #A				
Ammonia nitrogen	<0.4 mg/l	08/11/89	Rogers	Distillation Nesslerization
E.C.I. #92,137				
Sample #C				
Cyanide, total (CN)	0.005 mg/l	08/11/89	Young	Distillation/ Colorimetric
E.C.I. #92,138				
Sample #S				
Silver, total	0.039 mg/l	08/14/89	Isler	Flame atomic abs.

Remarks

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Laboratory Report

Date 08/25/89 Page 1 of 1

Lab Control No. 92,597 thru 92,599

P.O. Number 89-M-0532 Job No. 007137

Sample Source
US Army Jefferson Proving Grnd
Commander
Attn: STEJP-EH (K. Joshi)
Madison, IN 47250-5100
Attn: Mr. Kaushik N. Joshi

Bill To: FINANCE ACCT. OFFICER Attn: STEJP-RM-F
Madison, IN 47250-0000

Sample Description: Wastewater | Sample Type: 24 HR COMPOSITE | Location: Sample identification given below

Date Collected: 08-15-89 | Date Received: 08/15/89 | Collected By: Client | Time of Collection: 00:00

Parameter	Results	Date Analyzed	Analyst	Method of Analysis
E.C.I. #92,597				
STP effluent Sample #7A				
Ammonia nitrogen	0.55 mg/l	08/16/89	Rogers	Distillation Nesslerization
E.C.I. #92,598				
STP effluent Sample #7S				
Silver, total	0.012 mg/l	08/24/89	Isler	Flame atomic abs.
E.C.I. #92,599				
STP effluent Sample #7C				
Cyanide, total (CN)	0.010 mg/l	08/17/89	Young	Distillation/ Colorimetric

Remarks

State Certification No. M-10-1

Analysis Reviewed By Sarah Rogers

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Laboratory Report

Date 09/01/89 Page 1 of

Lab Control No 93,228 thru 93,230

P.O. Number 89-M-0532 Job No. 007137

Sample Source
US Army Jefferson Proving Grnd
Commander
Attn: STEJP-EH (K. Joshi)
Madison, IN 47250-5100
Attn: Mr. Kaushik N. Joshi

Bill To: FINANCE ACCT. OFFICER Attn: STEJP-RM-F
Madison, IN 47250-0000

Sample Description Waste Water | Sample Type 24 HR COMPOSITE | Location Sample identification given below

Date Collected 08/22/89 | Date Received 08/23/89 | Collected By client | Time of Collection 00:00

Parameter	Results	Date Analyzed	Analyst	Method of Analysis
E.C.I. #93,228				
Sewer Treatment Plante Eff.#8A				
Ammonia nitrogen	0.46 mg/l	08/23/89	Rogers	Distillation Nesslerization
E.C.I. #93,229				
Sewer Treatment Plante Eff.#8s				
Silver, total	0.007 mg/l	08/24/89	Isler	Flame atomic abs.
E.C.I. #93,230				
Sewer Treatment Plante Eff.#8C				
Cyanide, total (CN)	0.006 mg/l	08/25/89	Young	Distillation/ Colorimetric

Remarks

State Certification No. M-10-1

Analysis Reviewed By Sarah C Rogers

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Laboratory Report

Sample Source

US Army Jefferson Proving Grnd
Commander
Attn: STEJP-EH (K. Joshi)
Madison, IN 47250-5100
Attn: Mr. Kaushik N. Joshi

Date 11/14/89 Page 1 of 1

Lab Control No. 96,862 thru 96,864

P.O. Number 89-M-0532 Job No. 007137

Bill To:

FINANCE ACCT. OFFICER Attn: STEJP-RM-F
Madison, IN 47250-0000

Sample Description	Sample Type	Location
Wastewater	GRAB	Sample identification given below

Date Collected	Date Received	Collected By	Time of Collection
10/11/89	10/12/89	Client	00:00

Parameter	Results	Date Analyzed	Analyst	Method of Analysis
E.C.I. #96,862				
Sample #9 (A)				
Ammonia nitrogen	0.42 mg/l	11/01/89	Rogers	Distillation Nesslerization
E.C.I. #96,863				
Sample #9 (C)				
Cyanide, total (CN)	<0.005 mg/l	11/13/89	Young	Distillation/ Colorimetric
E.C.I. #96,864				
Sample #9 (S)				
Silver, total	0.005 mg/l	10/18/89	Morton	Flame atomic abs.

Remarks

State Certification No. M-10-1

Analysis Reviewed By Jack Rogers

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Laboratory Report

Sample Source

US Army Jefferson Proving Grnd
Commander
Attn: STEJP-EH (K. Joshi)
Madison, IN 47250-5100
Attn: Mr. Kaushik N. Joshi

Date: 11/10/89 Page 1 of 2

Lab Control No.: 97,953 thru 97,957

P.O. Number: 03-90-M-0039 Job No.: 007137

Bill To:

FINANCE ACCT. OFFICER Attn: STEJP-RM-F
Madison, IN 47250-0000

Sample Description	Sample Type	Location
Sludge	GRAB	Sample identification given below

Date Collected	Date Received	Collected By	Time of Collection
09-28-89	10/24/89	Client	00:00

Parameter	Results	Date Analyzed	Analyst	Method of Analysis
E.C.I. #97,953 Sample #1 EPA EXTRACTION PROCEDURE	PERFORMED	10/30/89	Vick	SW-846 Test Methods Evaluating Solid Wast
E.C.I. #97,953 Sample #1 Silver (leachate)	0.008 mg/l	11/08/89	Morton	Flame atomic abs.
E.C.I. #97,954 Sample #2 EPA EXTRACTION PROCEDURE	PERFORMED	10/30/89	Vick	SW-846 Test Methods Evaluating Solid Wast
E.C.I. #97,954 Sample #2 Silver (leachate)	0.014 mg/l	11/08/89	Morton	Flame atomic abs.
E.C.I. #97,955 Sample #3 EPA EXTRACTION PROCEDURE	PERFORMED	10/30/89	Vick	SW-846 Test Methods Evaluating Solid Wast

Remarks

State Certification No. M-10-1

Analysis Reviewed By Sarah C. Rogers

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Environmental Consultants
Professional Laboratory Services

Laboratory Report

Date 11/10/89 Page 2 of 2
Lab Control No. 97,953 thru 97,957
P.O. Number 03-90-M-0039 Job No. 007137

Sample Source
US Army Jefferson Proving Grnd
Commander
Attn: STEJP-EH (K. Joshi)
Madison, IN 47250-5100
Attn: Mr. Kaushik N. Joshi

Bill To:
FINANCE ACCT. OFFICER Attn: STEJP-RM-F
Madison, IN 47250-0000

Sample Description	Sample Type	Location
Sludge	GRAB	Sample identification given below

Date Collected	Date Received	Collected By	Time of Collection
09-28-89	10/24/89	Client	00:00

Parameter	Results	Date Analyzed	Analyst	Method of Analysis
E.C.I. #97,955 Sample #3 Silver (leachate)	0.009 mg/l	11/08/89	Morton	Flame atomic abs.
E.C.I. #97,956 Sample #4 EPA EXTRACTION PROCEDURE PERFORMED		10/25/89	Weldon	SW-846 Test Methods Evaluating Solid Wast
E.C.I. #97,956 Sample #4 Silver (leachate)	0.007 mg/l	10/31/89	Isler	Flame atomic abs.
E.C.I. #97,957 Sample #5 EPA EXTRACTION PROCEDURE PERFORMED		10/25/89	Weldon	SW-846 Test Methods Evaluating Solid Wast
E.C.I. #97,957 Sample #5 Silver (leachate)	0.008 mg/l	10/31/89	Isler	Flame atomic abs.

Remarks

State Certification No. M-10-1

Analysis Reviewed By Sarah Rogers

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CHEMICAL SERVICE LABORATORY, INC.

P.O. BOX 1586 • JEFFERSONVILLE, INDIANA 47130 • (812) 282-1359

Laboratory Report

FROM: Contracting Division
USA Jefferson Proving Ground
Madison, IN 47250-5100

DATE: 9/9/87

SAMPLE DESCRIPTION:
Grab Sample of sludge, Sewage Treatment Plant, I.D. #F-3
7/8/87

DATE RECEIVED: 8/13/87

PURCHASE ORDER NO.: PC #0319

CSL NO.: A 227

EP Toxicity for Silver - mg/l	<.05

REMARKS:

REVIEWED BY: [signature]

Chemical Service Laboratory, Inc.

P.O. BOX 1586 • JEFFERSONVILLE, INDIANA 47130 • (812) 282-1359

Laboratory Report

FROM: Contracting Division
USA Jefferson Proving Ground
Madison, IN 47250-5100

DATE: 9/9/87

SAMPLE DESCRIPTION:
Grab Sample of sludge, Sewage Treatment Plant, I.D. #F-3
7/8/87

DATE RECEIVED: 8/13/87

PURCHASE ORDER NO.: PC #0319

CSL NO.: A 228

EP Toxicity for Silver - mg/l	$<.05$

REMARKS:

REVIEWED BY: [signature]

CHEMICAL SERVICE LABORATORY, INC.
P.O. BOX 1586 • JEFFERSONVILLE, INDIANA 47130 • (812) 282-1359

Laboratory Report

FROM: Contracting Division
USA Jefferson Proving Ground
Madison, IN 47250-5100

DATE: 9/9/87

SAMPLE DESCRIPTION:
Grab Sample of sludge, Sewage Treatment Plant, I.D. #F-3
7/8/87

DATE RECEIVED: 8/13/87

PURCHASE ORDER NO.: PC #0319

CSL NO.: A 227

EP Toxicity for Silver - mg/l	<.05

REMARKS:

REVIEWED BY: [signature]

CHEMICAL SERVICE LABORATORY, INC.
P.O. BOX 1586 • JEFFERSONVILLE, INDIANA 47130 • (812) 282-1359

Laboratory Report

FROM: Contracting Division
USA Jefferson Proving Ground
Madison, IN 47250-5100

DATE: 9/9/87

SAMPLE DESCRIPTION:
Grab Sample of sludge, Sewage Treatment Plant, I.D. #F-3
7/8/87

DATE RECEIVED: 8/13/87

PURCHASE ORDER NO.: PC #0319

CSL NO.: A 228

EP Toxicity for Silver - mg/l <.05

REMARKS:

REVIEWED BY: [signature]

APPENDIX 5
HAZARDOUS WASTES STORED AT BUILDING 305

1.	(2)	55 Gal. Drums Asphalt Alum. Roof Coating - Liquid Cement.
2.	(1)	55 Gal. Drum PCP (50 Gals.) in 85 Gal. Recovery Drum.
3.	(1)	55 Gal. Drum 60% Solvent Oil, 20% Tapeze, 20% Solvent.
4.	(4)	55 Gal. Drums Waste Paint Sludge, Thinner & Mineral Spirits.
5.	(1)	55 Gal. Drum (5 Gals.) Paint Thinner.
6.	(1)	25 Gal. Drum, Fiber (Partial Full) Toluene, Methylene Ketone Peroxide Resin.
7.	(2)	25 Gal. Fiber Drums with Open Burning Residue Ash (Lead).
8.	(8)	Mercury Relay Switches (in Cardboard box), contain Mercury.
9.	(1)	25. Gal. Fiber Drum CARC Paint Waste.
10.	(1)	25 Gal. Metal Drum Trichloroethane Contaminated Filters.
11.	(5)	1 Gal. Plastic Jugs - Mikroklene (Detergent, Germacide).
12.	(45)	30 Gal. Drums (25 Gal. Fiber Drums Inside) Inert Filler A+B+ Trace Methylene Chloride.
13.	(1)	2.5 Gal. Jug (1.5 Gals.) Spent Ammonia 26% Solution.
14.	(2)	Bottles, (1-2 GAl., 1-1 Gal.) Copper Sulfate 5% Solution.
15.	(1)	30 Gal. Steel Drum Di-Octylphthalate (Liquid).
16.	(1)	55 Gal. Steel Drum 1,1,1-Trichloroethane.
17.	(1)	30 Gal. Steel Drum (5 Gals.) Methylene Chloride.
18.	(1)	Transformer - 6 1/4 Gal. (274 ppm).
19.	(2)	5 Gal. Cans Switch Oil (274 ppm).
20.	(2)	Non-PCB Transformers (None Detected).
21.	(1)	Partial bag asbestos material.
22.	(1)	5 Gal. Can Adhesive.
23.	(1)	5 Gal. Can Paint.
24.	(1)	Plastic Bag - Wood sawdust, Misc. Paper, rags, plastic bottles.
25.	(1)	Plastic Bag - Sweeping Compound (Bldg. 305 Floor, Water).

APPENDIX 6
INVENTORY OF TRANSFORMERS

MAKE	KVA	CYC	LOCATION	SERIAL#	PCB
Westinghouse	100	60	B-100	6725916	92
Westinghouse	100	60	B-100	6725913	96
Westinghouse	100	60	B-100	6725915	131
Weaver Elec.	25	60	TH-45	16735	907
Weaver Elec.	25	60	TH-45	16736	178
Weaver Elec.	25	60	TH-45	16737	777
Weaver Elec.	25	60	TH-46	16746	ND
Weaver Elec.	25	60	TH-46	16748	200
Weaver Elec.	25	60	TH-46	16752	ND
Uptegraff	10	60	TH-47	20858	ND
Uptegraff	10	60	TH-47	20859	ND
Uptegraff	10	60	TH-47	20861	ND
Uptegraff	15	60	TH-48	20844	ND
Uptegraff	15	60	TH-48	20849	ND
Uptegraff	15	60	TH-48	20851	ND
General Elec.	25	60	Fac. 49	9284791	128
Westinghouse	25	60	Fac. 49	3005441	ND
Westinghouse	25	60	Fac. 49	3005482	58
Kuhlman	25	60	B-101	4626071001	ND
Kuhlman	25	60	B-101	4626071002	ND
Kuhlman	25	60	B-101	4626071003	ND
Uptegraff	15	60	B-102	20835	ND
Balteau Standard	667	60	B-102A	PNL0770	ND
Balteau Standard	667	60	B-102A	PNL0779	ND
Balteau Standard	667	60	B-102A	PNL0780	ND
Westinghouse	333	60	B-102A	85A262022	ND
Westinghouse	333	60	B-102A	85A240659	ND
Westinghouse	333	60	B-102A	85A240658	ND
Westinghouse	25	60	B-104	572292	1072
Westinghouse	25	60	B-104	68AD2453	ND
Westinghouse	25	60	B-104	68AD2494	ND
Uptegraff	50	60	B-107	20801	ND
Uptegraff	50	60	B-107	20802	6
Uptegraff	50	60	B-107	20803	6
Westinghouse	75	60	B-113	71AD5031	ND
Westinghouse	75	60	B-113	71AF10199	ND
Westinghouse	75	60	B-113	71AF12034	ND
Uptegraff	25	60	B-129	20812	81
Uptegraff	25	60	B-129	20830	ND
Uptegraff	25	60	B-129	23718	33
Uptegraff	5	60	B-133	21087	ND

MAKE	KVA	CYC	LOCATION	SERIAL#	PCD
General Elec.	15	60	B-136	B589035	ND
General Elec.	15	60	B-136	B589037	ND
General Elec.	15	60	B-136	B589038	ND
Westinghouse	50	60	B-137	71AJ8912	ND
Westinghouse	50	60	B-137	71AJ8913	ND
Westinghouse	50	60	B-137	71AJ8914	ND
Uptegraff	5	60	B-139	21083	ND
Uptegraff	5	60	B-139	21088	ND
Uptegraff	5	60	B-139	22266	.54
Westinghouse	50	60	TH-143	6400491	5
Westinghouse	50	60	TH-143	6402836	8
Westinghouse	50	60	TH-143	6402844	9
General Elec.	10	60	B-148	95G336	ND
Uptegraff	25	60	B-162	20827	ND
Westinghouse	25	60	B-162	6446314	ND
Westinghouse	25	60	B-162	6448408	ND
Pad Mount	112.5	60	Sewage Plt.	S800690N	ND
Square "D"	30	60	Sewage Plt.	3349-171212-024	ND
General Elec.	25	60	B-186	6880858	ND
Uptegraff	25	60	B-186	20806	ND
Uptegraff	25	60	B-186	20817	ND
Uptegraff	25	60	B-203	20807	ND
Uptegraff	25	60	B-203	20825	ND
Uptegraff	25	60	B-203	20829	ND
Central	37.5	60	B-206	184834	ND
Central	37.5	60	B-206	184835	ND
Central	37.5	60	B-206	184837	ND
General Elec.	25	60	B-210	L138261Y73AA	ND
General Elec.	25	60	B-210	L140308Y73AA	ND
General Elec.	25	60	B-210	L138266Y73AA	ND
Uptegraff	25	60	B-213	20804	ND
Uptegraff	25	60	B-213	20805	ND
Uptegraff	25	60	B-213	20813	ND
Uptegraff	25	60	B-214	20814	ND
Uptegraff	25	60	B-214	20819	ND
Uptegraff	25	60	B-214	20822	ND
General Elec.	37.5	60	B-215	B703370	ND
General Elec.	37.5	60	B-215	B703387	ND
General Elec.	37.5	60	B-215	B769898	ND
Central	37.5	60	B-217	184832	ND
Central	37.5	60	B-217	184836	ND
Central	37.5	60	B-217	184838	ND

MAKE	KVA	CYC	LOCATION	SERIAL#	PCB
RTE	25	60	B-218	821083179	ND
RTE	25	60	B-218	821079443	ND
RTE	25	60	B-218	821083180	ND
Weaver	37.5	60	B-228	16729	ND
Weaver	37.5	60	B-228	16731	ND
Weaver	37.5	60	B-228	16738	78
Weaver	25	60	B-229	16753	12
General Elec.	25	60	B-229	L395795Y74AA	ND
General Elec.	25	60	B-229	L396798Y74AA	ND
Standard	75	60	B-233	85199	74
Standard	75	60	B-233	85200	47
Standard	75	60	B-233	85201	78
Howard	25	60	B-264	34527-2083	ND
Howard	25	60	B-264	34529-2083	ND
Howard	25	60	B-264	34532-2083	ND
Howard	25	60	B-267	34531-2083	ND
Howard	25	60	B-267	34533-2083	ND
Howard	25	60	B-267	34535-2083	ND
Line Material	25	60	B-287	282496	38
Line Material	25	60	B-287	282508	ND
Line Material	25	60	B-287	282587	ND
Howard	25	60	D Pos.	34528-2083	ND
Howard	25	60	D Pos.	34530-2083	ND
Howard	25	60	D Pos.	73969-4383	ND
Magnetic	25	60	J Pos.	HE13595	ND
Magnetic	25	60	J Pos.	HE13596	ND
Magnetic	25	60	J Pos.	HE13597	ND
General Elec.	25	60	TH-295X	B435358	312
General Elec.	25	60	TH-295X	B435371	317
General Elec.	25	60	TH-295X	B437026	96
Uptegraff	10	60	B-302	17111KK	ND
Uptegraff	25	60	B-309	20808	ND
Uptegraff	25	60	B-309	20815	ND
Uptegraff	25	60	B-309	20824	ND
Magnetic	75	60	B-312	HHO 6677	ND
Magnetic	75	60	B-312	HHO 6678	ND
Magnetic	75	60	B-312	HHO 6679	ND
Uptegraff	5	60	B-321	21077	ND
Uptegraff	5	60	B-321	21079	ND
Uptegraff	5	60	B-321	21175	ND
Westinghouse	25	60	B-329	6446341	13
Westinghouse	25	60	B-329	6446395	17
Westinghouse	25	60	B-329	6448402	ND

MAKE	KVA	CYC	LOCATION	SERIAL#	PCB
McGraw-Edison	15	60	B-333	72ZN107005	ND
McGraw-Edison	15	60	B-333	72ZN107009	ND
McGraw-Edison	15	60	B-333	72ZN107013	ND
Van Tran Elec.	15	60	B-481	84V3233	ND
General Elec.	5	60	B-488	9347593	ND
Howard	25	60	500 Center	34534-2083	ND
Howard	25	60	500 Center	73930-4383	ND
Howard	25	60	500 Center	86164-4983	ND
RTE	15	60	B-501	781122359	ND
RTE	15	60	B-501	781122360	ND
RTE	15	60	B-501	781122361	ND
General Elec.	50	60	B-504	B395368	640
General Elec.	50	60	B-504	B395369	627
General Elec.	50	60	B-504	B395389	164(
Uptegraff	7.5	60	B-508	21063	ND
Uptegraff	7.5	60	B-508	21064	ND
Uptegraff	7.5	60	B-508	21065	ND
Central	10	60	B-518	1848-4	ND
Moloney	50	60	B-534	705959	ND
Moloney	50	60	B-534	705965	ND
Moloney	50	60	B-534	705966	ND
General Elec.	25	60	B-542	E-426471-62P	161
Uptegraff	25	60	B-542	24008	53
Moloney	25	60	B-542	672939	741
Westinghouse	50	60	B-600	6034259	ND
Westinghouse	50	60	B-600	6034300	ND
Westinghouse	50	60	B-600	6034320	ND
Uptegraff	7.5	60	600 Tower	21067	9
Westinghouse	15	60	B-602	6023566	ND
Westinghouse	15	60	B-602	6025294	ND
Westinghouse	15	60	B-602	6025292	ND
Allis Chambers	10	60	M-603	211769	ND
Allis Chambers	10	60	M-603	211798	ND
Allis Chambers	10	60	M-603	211869	ND
General Elec.	37.5	60	B-605	6571967	ND
Kuhlman	10	60	B-605	944280	ND
Uptegraff	15	60	B-609	20832	ND
Uptegraff	15	60	B-609	20841	ND
Uptegraff	15	60	B-609	20845	ND
Kuhlman	25	60	B-609	4626911-001	ND
Kuhlman	25	60	B-609	4626911-002	ND
Kuhlman	25	60	B-609	4626911-003	ND

MAKE	KVA	CYC	LOCATION	SERIAL#	PCB
Magnetic	25	60	A Pos.	HG06199	ND
Magnetic	25	60	A Pos.	HG06200	ND
Magnetic	25	60	A Pos.	HG06201	ND
Westinghouse	50	60	B-612	6034287	ND
Westinghouse	50	60	B-612	6034294	ND
Westinghouse	50	60	B-612	6034331	ND
Westinghouse	50	60	B-617	6034302	ND
Westinghouse	50	60	B-617	6034298	ND
Westinghouse	50	60	B-617	6034301	ND
General Elec.	50	60	A Pos.	J105343Y69A	ND
General Elec.	50	60	A Pos.	J108247Y69A	ND
General Elec.	50	60	A Pos.	J108248Y69A	ND
Westinghouse	5	60	B-700	6453127	ND
Kuhlman	37.5	60	21,000 West	C27398	ND
General Elec.	25	60	Gate 1	E816498-61R	ND
General Elec.	10	60	Gate 3	J138772Y69A	ND
Uptegraff	10	60	Gate 8	20862	ND
Moloney	3	60	Gate 19	701224	ND
Allis Chambers	5	60	Gate 9	2572532	ND
Howard	25	60	Gator Mine	739731-4383	ND
Howard	25	60	Gator Mine	29392-4383	ND
Howard	25	60	Gator Mine	29300-1534	ND
Howard	25	60	Y Pos.	73974-4383	ND
Howard	25	60	Y Pos.	73972-4383	ND
Howard	25	60	Y Pos.	73973-4383	ND
Allis Chambers	3	60	Old Timbers	1664260	ND
Westinghouse	10	60	Old Timbers	6482323	ND
Allis Chambers	5	60	Old Timbers	2572490	ND
Uptegraff	10	60	Old Timbers	20860	ND
Uptegraff	10	60	Old Timbers	20865	ND
Uptegraff	15	60	Old Timbers	20836	ND
Uptegraff	15	60	Z Pos.	20840	ND
General Elec.	15	60	K- Lake	J138773Y69A	ND
Westinghouse	25	60	K- Lake	59B11892	ND
Westinghouse	5	60	W. Signal	2808326	ND

MAKE	KVA	CYC	LOCATION	SERIAL#	PCB
Uptegraff	15	60	W. Signal	20839	ND
Uptegraff	15	60	W. Signal	20837	ND
General Elec.	10	60	W. Signal	6693246	ND
Uptegraff	5	60	Hyde Pond	21075	ND
Uptegraff	15	60	N. W. Exit	20838	ND
Uptegraff	10	60	Big Tree Pt.	20864	ND
Westinghouse	10	60	K-Rd.	6500923	ND
Standard	10	60	K-Rd.	25337	ND
Uptegraff	15	60	K-Rd.	20846	ND
Uptegraff	10	60	K-Rd.	20855	ND
Westinghouse	10	60	Drop Tower	2727435	ND
Uptegraff	15	60	Emer. Landing	20854	ND
Kuhlman	10	60	Shape Chrg.	944281	ND
Uptegraff	10	60	480 Tower	20857	ND
Magnetic Trans.	10	60	C-Rd.-Jines	HE11667	ND
Westinghouse	10	60	Jines	6057303	ND
Westinghouse	10	60	Jines	6057304	ND
Moloney	3	60	F-Rd.	701225	ND
Allis Chambers	5	60	Jines	2572503	ND
Westinghouse	5	60	Jines	6055934	ND
Kuhlman	5	60	H-Rd.	825700	ND
Westinghouse	25	60	Jines	6448404	ND
RTE	10	60	Jines	8210347429	ND
Uptegraff	5	60	I-Rd.	21086	ND
Westinghouse	5	60	Jines	6057300	ND
Westinghouse	5	60	Jines	6041205	ND
General Elec.	10	60	Jines	J564305Y70	ND
Uptegraff	10	60	N.E. Exit	21085	ND
Westinghouse	10	60	K-Rd.	6482307	ND

MAKE	KVA	CYC	LOCATION	SERIAL#	PCB
Weaver	25	60	Shun Pike	16747	ND
Westinghouse	167	60	B-711	82A490346	ND
Westinghouse	167	60	B-711	82A490347	ND
Westinghouse	167	60	B-711	82A90348	ND
H.K. Porter	10	60	Gator Mine	5501044	ND
Magnetic	10	60	J-Pos.	HF00392	ND
Magnetic	10	60	J-Pos.	HF00394	ND
Magnetic	10	60	J-Pos.	HF00391	ND
Magnetic	10	60	J-Pos.	HF00393	ND
Westinghouse	10	60	Jines	2718789	ND
Westinghouse	7.5	60	D-Rd.	3043017	ND
Allis Chambers	3	60	I-Rd.	1664265	ND
Line Material	10	60	N.E. Pole Barn	280152	ND
Howard	10	60	Gate 22	71151-4183	ND
Line Material	15	60	B-194	271608	ND
McGraw Edison	10	60	Shape Chrg.	87NJ171-003	ND
Line Material	10	60	Shape Chrg.	280156	ND
Line Material	10	60	18,000 W.	280144	ND
Van Tran	15	60	18,000 W.	84V3230	ND
Magnetic	25	60	108A	H100786	ND
Magnetic	25	60	108A	H100785	ND
Magnetic	25	60	108A	H100787	ND
Uptegraff	10	60	108A	21058	ND
General Elec.	50	60	108A	16732	ND
General Elec.	50	60	108A	16733	ND
General Elec.	50	60	108A	16734	ND
General Elec.	UNKNOWN	60	B-305	4926647	ND
Westinghouse	50	60	B-314	59B11669	ND
Kuhlman	37.5	60	B-314	C27405	ND
Van Tran	15	60	B-502	84V3229	ND
Van Tran	15	60	B-502	84V3219	ND
Van Tran	15	60	B-502	84V3222	ND
Uptegraff	25	60	B-502	20820	ND
Uptegraff	25	60	B-502	20823	ND
Uptegraff	25	60	B-502	20826	ND
Uptegraff	5	60	B-502	21080	ND
Moloney	3	60	B-502	701223	ND

APPENDIX 7
STANDARD OPERATING PROCEDURES FOR ASBESTOS

DEPARTMENT OF THE ARMY
U.S. ARMY JEFFERSON PROVING GROUND
MADISON, INDIANA 47250-5100

STEJP-EH-B-20

DATE: 7 July 1989

OPERATIONAL

STANDING OPERATING PROCEDURE
FOR
ASBESTOS ABATEMENT WORK AND
HANDLING FRIABLE ASBESTOS

DIRECTORATE: Engineering & Housing, STEJP-EH
DIVISION: Buildings, Grounds & Utilities, STEJP-EH-B
BRANCH: Buildings Branch, STEJP-EH-B
Utilities Branch, STEJP-EH-B

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MICHAEL P. TURNER, C, Utilities Branch

REVIEWED BY: Cleo E. Roseberry 20 oct 89
CLEO E. ROSEBERRY, C, Buildings Branch

REVIEWED BY: Chasteen Williams 10-20-89
CHASTEEN WILLIAMS, C, Equip Maint Branch

CONCURRENCE: Cleo E. Roseberry - for Tom Quiggle
THOMAS E. QUIGGLE, C, Bldgs, Grds & Util Div

CONCURRENCE: James A Fritsche 20 Oct 89
JAMES A. FRITSCHE, P.E., Dir, Engr & Hsg

CONCURRENCE: Mark H. Pierson
MAJ MARK H. PIERSON, Dir, Contr & Logistics

CONCURRENCE: Marie P Eggemeier for OHN
RONALD W. WILLIAMS, Occupational Health Nurse

CONCURRENCE: James D. Randall
JAMES RANDALL, Safety & Occup Health Manager

CONCURRENCE: Robert W Hudson 20 oct '89
ROBERT W. HUDSON, Technical Director

APPROVED BY: [illegible] 23 OCT 89
DENNIS E. O'BRIEN, COL, OD, Commanding

SUPERVISOR'S STATEMENT

SOP NO. STEJP-EH-B-20 REV NO.______ CHANGE NO._____ DATE______

1. The supervisor will sign this statement:

   a. When first assigned as supervisor to each new location.

   b. When an approved formal or interim change is made to the SOP.

   c. At least once per quarter during continuing operations.

2. I have personally reviewed each of the operational steps of the SOP and have no question in my mind that the operation can be performed safely, efficiently, and in an environmentally acceptable manner. I have been thoroughly trained and I am certified in an EPA-accredited training directly related to my part of the asbestos activity. I have trained the operators in the details of their part of the operation and have instructed them to follow the SOP without deviation:

SUPERVISOR'S NAME	DATE

OPERATOR'S STATEMENT

SOP NO. STEJP-EH-B-20 REV NO.______ CHANGE NO.______ DATE:________

1. The operator will sign this statement:

   a. When first assigned to each new location.

   b. When an approved formal or interim change is made to the SOP.

   c. At least once per quarter during continuing operations.

2. At the beginning of each operation, operators will also sign a similar statement provided by the test director for inclusion in the firing record.

3. I have read or have had read to me and understand the general and specific safety and environmental requirements, personnel limits, work description and inspection requirements necessary to accomplish my assignment. I have been thoroughly trained and I am certified in an EPA-accredited training directly related to my part of the asbestos activity and I agree to abide by these instructions throughout my assignment to the operation.

4. If I encounter anything NOT covered by the SOP, I will inform my supervisor or Installation Asbestos Coordinator to stop the asbestos activity as appropriate.

NAME	DATE	OPERATION NUMBER

SECTION I

FUNCTIONAL DIRECTION STEJP-EH

1. Purpose.

a. To protect the operator from exposure to friable asbestos fibers and to safeguard the general public and environment by preventing the emission of asbestos fibers from the work site.

b. To provide work practices, engineering controls, respiratory and personal protection, industrial hygiene measures, personal exposure and area air monitoring, medical surveillance, asbestos disposal and accredited training/certification in compliance with OSHA and US EPA (AHERA) requirements.

2. Applicability. This procedure applies to all renovation, demolition, or any maintenance activities involving removal, handling, disposal, repair encapsulation, enclosure or any accidental spill of building materials containing or suspected to contain asbestos at Jefferson Proving Ground (JPG).

3. Responsibilities. The Director of Engineering and Housing has overall responsibility of implementing the Installation Asbestos Management except medical surveillance program which is implemented by Occupational Health Nursing Office. The Chief, Buildings, Grounds and Utilities Division has specific responsibility for this procedure and will assure compliance with the following:

a. The Chief of the Buildings Branch and Chief of the Utilities Branch are responsible for establishing and maintaining an adequate program to provide a thorough understanding of the procedures contained in this SOP to their respective operators.

b. The Chief of the Buildings Branch and Chief of the Utilities Branch are responsible for assuring that all respective personnel under their supervision are furnished the necessary protective clothing, respirators with appropriate protection factors, equipment, and devices to accomplish the asbestos assignment.

c. The Chief of the Buildings Branch and Chief of the Utilities Branch will assure that this SOP is posted at the assignment building and that procedures described herein are followed without deviation. The Branch Chiefs are responsible for signing the Supervisor's Statement on page 2 of this SOP and also for ensuring that all their respective operators on the job have signed the Operator's Statement on page 3.

d. Each operator engaged in any asbestos related activities is individually responsible for fully understanding and complying with the procedures contained herein.

e. The Installation Asbestos Coordinator will be responsible for assuring that all personnel engaged in the asbestos related activities are furnished the necessary U.S. EPA accredited training and certification. He is also responsible for inspecting buildings for asbestos containing materials, developing management plans, personal exposure and area air monitoring samples and analysis; and notifying the State of Indiana on removal, demolition and disposal activities.

f. The Occupational Health Nursing Office will be responsible for establishing and maintaining medical surveillance program for all operators either exposed to asbestos at or above action level (0.1 f/cc Time Weighted Average) or required to wear negative pressure air purifying respirators. The medical surveillance shall comply with Army Guidance TG 148 and OSHA 29 CFR Part 1926.58 Appendix D instructions.

4. Policy. Any new asbestos or asbestos containing materials will not be used or installed in any building or equipment on JPG if an acceptable substitute is available.

SECTION II

FUNCTIONAL REQUIREMENTS

All operators, supervisors and the Installation Asbestos Coordinator must have received EPA-accredited training and certification prior to their asbestos work assignment. Annual update is mandatory to renew the certification.

1. Notice of Intention. Before beginning any asbestos related activity, the supervisor shall inform the Asbestos Coordinator of (1) building and location, (2) linear feet or square feet of asbestos to be removed, (3) renovation or demolition, (4) prior use of building and future use of building, and (5) scheduled starting date and approximate completion date. Notice of Intention should be forwarded to the Asbestos Coordinator as soon as possible to ensure compliance with the State Notification requirements.

2. State of Indiana Notification Requirement. Before beginning any demolition or renovation of building projects involving asbestos removal, the Asbestos Coordinator shall submit completed written notification form to the State Asbestos Coordinator in the Office of Air Management as per the following State schedule:

Project Description	Deadline for Notification Renovation	Demolition
Greater than or equal to 260 linear feet (pipes) or 160 square feet (surface materials) of asbestos containing materials (ACM) to be removed.	As soon as possible before work begins.	At least 10 days before work begins.
Less than 260 linear feet or 160 square feet of ACM.	Not Applicable.	At least 20 days before work begins.
Facility condemned by State or Local Agency.	Not Applicable.	As soon as possible before work begins.

Failure to comply with the notification requirement shall result in violation of the Federal/State law.

3. Pre-Removal Preparation.

a. Respiratory Protection

(1) All respiratory protection shall be provided by the installation respiratory protection program which shall meet the requirements of 29 CFR 1910.134.(b)(1-11).

(2) Operators shall be provided with personally issued and marked respiratory equipment approved by NIOSH and fit-tested by the responsible industrial hygienist from Preventive Medicine, Fort Knox Office. Appropriate protection factors shall be considered by the Industrial Hygienist in selecting the type of respiratory protection.

TABLE 1 - RESPIRATORY PROTECTION

When respiratory protection is required, Jefferson Proving Ground shall institute a respiratory protection program in accordance with 29 CFR 1910.134, AR 40-5, TB MED 502, TB MED 509, TB MED 513, and ANSI Z88.2.

Airborne Concentration of ACM	Required Respirator (a,b)	Required Fit Testing
Not in excess of 2 f/cc (10 x PEL)	Half-mask air-purifying respirator equipped with	Qualitative or Quantitative
	Full face piece air-purifying respirator equipped with high-efficiency fiilters	Qualitative
Not in excess of 10 f/cc (50 x PEL)	Full Face piece air-purifying respirator equipped with high-efficiency filters	Quantitative
Not in excess of 20 f/cc (100 x PEL)	Any powered air-purifying respirator (PAPR) equipped with high efficiency filters(d)	Not Required
	Any supplied-air respirator operated in continuous flow mode	Not Required
Not in excess of 200 f/cc (1,000 x PEL)	Full face piece supplied-air respirator operated in pressure demand mode	Not Required
Greater than 200 f/cc (1,000 x PEL) or unknown concentration	Full face piece supplied-air respirator operated in pressure demand mode equipped with an auxiliary positive-pressure self-contained breathing apparatus	Not Required

a. Respirators assigned for higher environmental concentration can be used at lower concentrations.
b. A high-efficiency filter is at least 99.97 percent efficient against mono-dispersed particles of 0.3 micrometers in diameter or larger.
c. Sources: 29 CFR 1910.1001, Table 1 and 29 CFR 1926.58, Table 1, as amended.
d. NIOSH assigned protection factor for any PAPR equipped with a tight-fitting face piece is 50 and with a loose fitting face piece is 25 as determined by Los Alamos National Laboratories by conducting quantitative fit testing on a panel of human volunteers.

TABLE 1 - RESPIRATORY PROTECTION

(3) Presents respirator types that are required for different airborne concentration of asbestos, and fit testing requirements.

b. Clothing Protection

(1) Operators shall be provided with sufficient sets of protective full-body, fire retardant, impervious, one-piece clothing. Such clothing shall consist of disposable TYVEK coveralls with booties and hood. Eye protection and hard hats shall be provided if required by applicable safety regulations. Proper use of protective clothing requires that all openings be closed and that garments fit snug around the neck, waist, and ankles. The wrist and ankle junctions, as well as the collar opening of the outer disposable coveralls, shall be taped, as necessary to prevent contamination of the skin and undergarments. (NOTE: Eye protection is highly recommended).

(2) All authorized visitors shall be provided with suitable protective clothing, headgear, eye protection and footwear whenever they are required to enter the work area.

c. Initial Monitoring.

(1) Take general area air samples in each area to determine airborne asbestos concentration baseline before initiating removal actions. NOTE. Where Jefferson Proving Ground has monitored the airborne asbestos concentrations, and the data was obtained during work operations conducted during closely resembling conditions, Jefferson Proving Ground may rely on such earlier monitoring results to satisfy the initial monitoring requirements.

(2) Use a high sampler (12 liters per minute sampling) to collect general area air samples for two hours.

(3) The asbestos coordinator will determine if it is necessary to conduct initial monitoring.

d. Engineering Controls and Work Practices.

Perform the following engineering controls in any combination to achieve compliance with EPA AHERA (Asbestos Hazard Emergency Response Act) regulations and with OSHA Action Level of 0.1 airborne asbestos fiber of greater than 5 micrometer size per one cubic centimeter air (0.1f/cc).

(1) Shut down electric power and provide temporary power and lighting if it is necessary.

(2) Shut down and isolate heating, cooling, and ventilating air systems to prevent contamination and fiber dispersal to other areas of the structure.

(3) Pre-clean movable objects within the proposed work areas using HEPA vacuum equipment and/or wet-cleaning methods, and remove such objects from work areas to temporary location. Where "carpet-to-remain" is scheduled, such carpeting shall be thoroughly cleaned using HEPA vacuum equipment. Where scheduled to be removed, carpeting shall be disposed of as contaminated material.

(4) Pre-clean fixed objects within the proposed work areas using HEPA vacuum equipment and/or wet-cleaning methods, and enclose with a minimum of 6 mil plastic sheet sealing all ends or openings with duct tape.

(5) Seal off all openings (including but not limited to windows, corridors, doorways, skylights, ducts, grills, diffusers, and any other penetrations of the work areas) with plastic sheeting (minimum of 6 mils thick) sealed with tape. Doorways and corridors which will not be used for passage during the asbestos removal must be sealed with barriers after plastic has been placed.

(6) Cover floor and wall surfaces with plastic sheeting sealed with tape. Use a minimum of two layers of 6 mil plastic on floors and two layers on walls. Cover floors first so that plastic extends at least 12 inches up the walls, then cover walls with plastic sheeting to the floor level, thus overlapping the floor material by a minimum of 12 inches.

(7) Provide airlocks at entrances to and exits from the work areas.

(8) Negative Air Systems. If asbestos fiber release is reasonably anticipated to exceed the OSHA Permissible Exposure Limit (PEL) of 0.2 f/cc, maintain a negative air system in the work area keeping a minimum of 0.02 inch water negative pressure. Operate the negative air system throughout the removal operations, providing at least one air change every 15 minutes with filtering the exhaust air with HEPA filtration system. The negative air system may not be required for small and medium size removal operations involving the glove bag technique.

e. Work Decontamination Enclosure.

Construct a worker decontamination enclosure when a significant amount of asbestos release is anticipated above the permissible exposure limit.

(1) A suitable framing shall be built as approved by the supervisor or more preferrably, an EPA-approved, pre-fabricated decontamination trailer be used. In all cases, access between contaminated and uncontaminated rooms or areas shall be through an airlock. In all cases, access between any two rooms within the decontamination trailer shall be through a curtained doorway.

(2) An enclosure shall be constructed contiguous to the work area and consisting of three totally enclosed chambers. The equipment room will have two curtained doorways, one to the work area and one to the shower room. The work room will have two curtained doorways, one to the equipment room and one to the clean room. The waste water shall be filtered to 5 microns or less before being released into a ground drain.

(3) The clean room shall have one curtained doorway into the shower and one entrance or exit to the outdoors. The clean room shall have sufficient space for storage of the workers' street clothes, towels, and other noncontaminated items.

(4) An equipment decontamination system shall be provided or constructed.

(5) Ensure that barriers and plastic linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.

f. Entry and Exit of Work Areas:

(1) Each worker shall, upon entering the job site, remove street clothes, put on a respirator and clean protective clothing before entering the work area.

(2) All workers shall, remove gross contamination from clothing before leaving the work area; proceed to the equipment room and remove all clothing except respirators; still wearing the respirator, proceed naked to the showers; clean the outside of the respirator with soap and water while showering; remove the respirator; and thoroughly shampoo and wash themselves.

(3) Following showering and drying off, each worker shall proceed directly to the clean change room and dress in clean clothes at the end of each day's work. Before re-entering the work area from the clean change room, each worker shall put on a clean respirator and shall dress in clean protective clothing.

(4) Workers removing asbestos bags from the decontamination enclosure shall enter the holding area from outside wearing a respirator and dressed in clean disposable coveralls. No worker shall use this system as a means to leave or enter the washroom or the work area.

(5) Workers shall not eat, drink, smoke, or chew gum or tobacco while in the work area or the enclosure system.

(6) Respirators shall be decontaminated after each use by wet sponging the entire respirator, drying with clean towel, and replacing of filters, removable seals, and other replaceable attachments in shower area when needed.

(7) Supervisory and inspection personnel entering the work area shall comply with all respiratory protective equipment, protective clothing, and decontaminated requirements. Unauthorized personnel shall not be allowed in the work area.

(8) Equipment Removal Procedures. Clean surfaces of contaminated equipment thoroughly by wet sponging or wiping before moving such items into uncontaminated areas.

(9) Warning signs must be of sufficient size to be clearly legible and shall display the following information:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA.

(10) Plastic bags to store asbestos for disposal should have the following information:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

4. PERSONAL EXPOSURE MONITORING.

a. The asbestos coordinator will coordinate personal exposure monitoring in accordance with OSHA Methods specified in 29 CFR 1926.58, Appendix A.

b. The supervisor will be responsible for collecting personal exposure samples. Determinations of employee exposure shall be made from breathing zone air samples that are representative of the 8-hour time weighted average (TWA) of each employee.

c. The supervisor will initially explain to his operators how to accurately set up the filter and pump assembly. The supervisor will then ensure that the filter is assembled accurately each time. A wrong assembly will result into VOID samples.

d. The air samples will be collected on a daily basis. The asbestos fiber count will be determined by transmission Electron Microscopy (TEM) analysis method in an EPA-accredited laboratory within 24 hours.

e. The asbestos coordinator and supervisor will monitor the asbestos fiber count results and will investigate if there are removal or sampling abnormalities.

f. The asbestos coordinator will send personal exposure monitoring results to JPG's OHNO Office for the individual's health record.

5. AREA AIR MONITORING DURING REMOVAL.

a. The asbestos coordinator will perform the area air monitoring in accordance with OSHA methods specified in 29 CFR 1926.58, Appendix A.

b. The asbestos coordinator will determine if it is necessary to conduct area air monitoring. Number of samples and frequency will be determined based on personal exposure concentration levels.

c. Area air monitoring will be terminated if it is determined not necessary.

6. MEDICAL SURVEILLANCE.

a. The Occupational Health Nursing Office (OHNO), located on JPG, with technical guidance of the Occupational Health Physician, MEDDAC, Fort Knox, Kentucky shall institute a medical surveillance program for all employees engaged in work involving levels of asbestos at or above the action level for 30 or more days per year or engaged in work requiring use of negative pressure respirators.

b. The Occupational Health Nurse (OHNO) will institute a medical surveillance program to include preplacement, periodic and termination examination IAW TG 148 for all employees engaged in asbestos work.

Justification: Concise means of defining whole occupational health program for asbestos workers using current Army guidance (TG 148). Appendix D to OSHA 29 CFR Part 1926.58 Medical Questionnaires, Mandatory describes what must be administered to all employees. The Part 1926.58 describes medical surveillance on pages 22760, 22761, 22762 in details. Employees will be provided copies of the physician's written opinions containing the results of the medical examinations.

7. RECORDKEEPING. Maintain the sampling, analysis, removal, disposal and medical surveillance records for the duration of the employment plus 30 years. Now for medical surveillance records, as per the OHNO office, when employees leave this installation, the medical record follows the employee or is retired. It is the Federal Government's responsibility to maintain these records, not just the JPG OHNO's.

Also document any significant incidents occurred during the operation with respect to time and personnel directly involved and description of the incidents.

8. SPILLS. In the event of an asbestos spill or significant emission of asbestos fibers, personnel involved in the operation will stop the removal and immediately begin cleaning the spill. During the clean-up of an asbestos spill, a half-mask, double cartridge respirator will be worn with disposable coverall and hood, disposable gloves and disposable booties. Spilled asbestos material will be completely saturated with water before any attempt is made to bag it for disposal. After as much of the spilled debris as possible has been picked up, a vacuum with HEPA filter will be used to finish the decontamination of the site.

SECTION III FUNCTIONAL PROCEDURES

1. REMOVAL OF ASBESTOS CONTAINING MATERIALS (ACM)

a. After preparation of work areas and decontamination enclosure, remove asbestos materials (insulation, ceiling panels and tiles, wall panels, etc.) within work areas progressively and carefully.

b. Use wet method and HEPA vacuum system, and hand tools only.

c. Saturate the asbestos material with water prior to beginning removal. Water must be amended with wetting agent such as soap. As the removal operation progresses, additional water will be applied in a low pressure fine spray manner. This is to prevent fiber disturbance and minimize emission of airborne asbestos.

d. Accomplish removal of asbestos material in small sections.

e. Pick up and bag the waste continuously.

f. Waste must remain wet at all times.

g. Thermal insulation, containing asbestos, after wetting, may be removed by scraping with a spatula or putty knife.

h. The use of tools such as saws or drills will be avoided since these tools generate a fine asbestos dust.

i. Following removal, the area will be wet cleaned.

j. Inspect the worksite and adjoining areas after all containment barriers, equipment and tools have been removed.

k. Reclean those surfaces where visible residues are detected.

2. GLOVEBAG TECHNIQUE PREPARATION.

a. It is recommended that glovebag removal be a 2-person job.

b. Post warning signs and rope off area with barrier tape to avoid any accidental entry into the work area.

c. Identify or set up emergency shower facilities.

d. If steam or hot water pipe, shut down in advance to cool. Standard glovebags will melt if it touches pipe hotter than 130 degrees - 150 degrees F.

e. Pre-clean: Wet clean and/or HEPA vacuum area as necessary.

f. Pipes should be wrapped in plastic and/or taped, especially any damaged sections, seams, cracks, etc.

-- Minimize fiber release
-- Provide good surface for glovebag attachment.

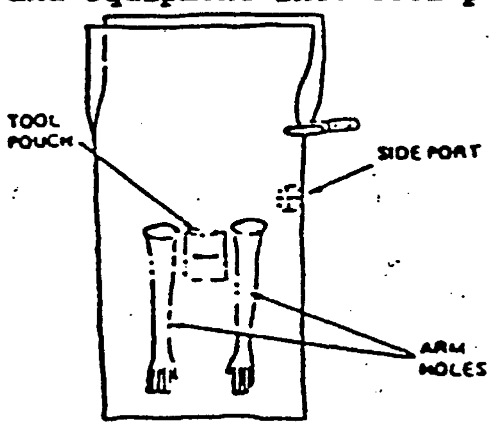
g. Spread two layers of ~~poly~~ polyethylene on floor underneath work area.

3. GLOVEBAG REMOVAL PROCEDURE.

a. Glovebag inspection: Check for any defects (reinforce bottom seam with duct tape).

b. Slit sides of bag 2" larger than pipe circumference.

c. Place tools and equipment into tool pouch inside the glovebag.

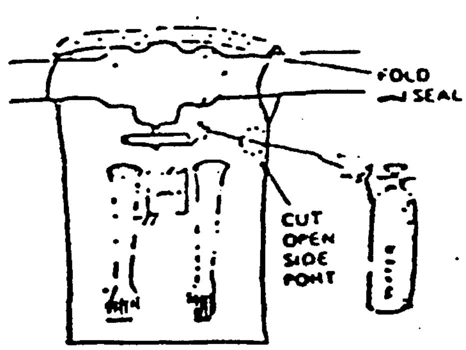


d. Attach glovebag to pipe: staple, fold over and tape the top. Remember, this sealed area will be supporting the weight of the debris; adequate support is necessary.

e. Tape or strap the ends securely and airtight to the pipe.

f. Test bag for leaks with smoke tube or "squeeze" test.

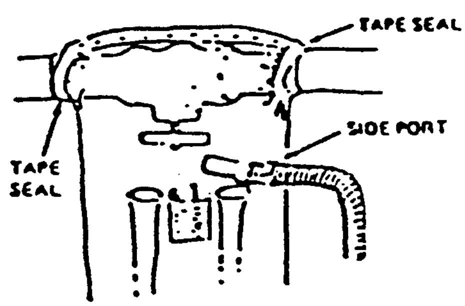
g. Insert sprayer wand into the small hole or port. Seal hole around wand with tape.



h. Glovebagging is best performed as a two-person operation. One person removes the covering using the glove-hands inside the bag while the other continually mists the pipe-covering and provides any additional support necessary.

i. Removal must be done carefully to avoid accidental tears in the glovebag and to minimize generation of dust. Pipe lagging is generally applied with wires or bands, and often comes with metal jacketing around the outside. Care must be taken when removing these to avoid puncturing the bag from the sharp edges. The material removed should be gently placed on the bottom of the bag to further avoid rips and tears. Steps to follow for removal:

(1) Mist inside of glovebag with amended water.
(2) Cut ends of insulation (if using bone saw, be careful not to cut through pipe).
(3) Make slit in insulation along bottom of pipe, cutting along seams whenever possible.
(4) Spray continuously at all cutting points.
(5) Spray tools and put in pouch.
(6) Gently remove insulation and place in bottom of glovebag (do not drop).
(7) Scrub and wipe down exposed pipe.
(8) Seal remaining exposed insulation ends, using "wettable" cloth, mastic, tape, or other sealant (bridging encapsulant).
(9) Spray-clean inside of glovebag from top to bottom.
(10) Spray encapsulant lockdown on to cleaned pipe.
(11) Remove sprayer wand and wipe with damp cloth as it is withdrawn and replace with HEPA vacuum. Reseal the hole and collapse the bag with the vacuum. This will create negative pressure in the bag and help reduce tears and leaks when removing the bag from the pipe.

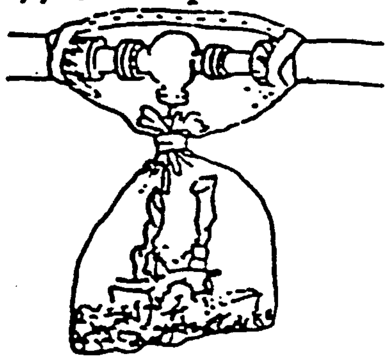


(12) Remove HEPA vacuum and seal hole.

j. Remove tools by grasping them in one glove hand and gently pulling glove and sleeve inside-out. Twist and then tape the glove sleeve tight, and cut through and tape, to remove the tools from the bag. Keep tools in glove to use for the next job, or open under water to clean them.

k. Remove glovebag from pipe as follows:

(1) Twist the bag tightly (under the pipe, but as close to the top as possible), and tape.



(2) Slip a 6-mil disposal bag over glovebag.
(3) Remove tape from top of glovebag, open glovebag top and fold it down into the disposal bag, and discard as asbestos waste properly sealed and labeled.

l. Remove protective clothing (not respirator) and put into disposal bag. Wet-wipe your respirator, and discard cleaning rag as asbestos waste.

m. Leave the work area, then remove respirator for proper cleaning and maintenance.

n. Air sampling is conducted during removal, to monitor employee exposure throughout the entire project and also after removal, to determine any leakage.

o. If a leak occurs during glovebag activities, use emergency procedures. Thoroughly clean and test the contaminated area.

4. FINAL INSPECTION.

a. Inspect the work site and adjoining areas after all containment barriers, equipment and tools have been removed.

b. No visible residue - reclean all surfaces if visible residue is found.

5. CLEARANCE AIR SAMPLING (AGGRESSIVE SAMPLING METHOD).

a. Keep an electric fan running in central location of the room to stir up the air during sample collection.

b. Collect the air sample using a 12 liters/minute high sampler for 2 hours.

c. Analyze the sample for asbestos fiber count by Transmission Electron Microscopy (TEM) analysis.

d. If the fiber count is more than 0.01 f/c.c., clean the entire work site again and take the sample and analyze.

6. ASBESTOS WASTE DISPOSAL.

a. Collect asbestos waste in sealed, impermeable 6-mil polyethylene bags imprinted with a caution label. The asbestos must be kept moist while collecting.

b. Label bags with date and building and store temporarily in Building 305 - HW Storage.

c. Prevent bags from rupturing during handling or transportation. Immediately place damaged bags in a strong, thick larger plastic bag which also has a caution sign.

d. Load vehicle with bags and other asbestos waste. Ensure workers handling bags are trained and provided with respirators and protective clothing.

e. Dispose of asbestos waste bags and other asbestos waste material in the onsite Gate 19 landfill in specified asbestos disposal cells. Excavate at least 2 feet of compacted earth at the landfill cell.

f. The asbestos coordinator will ensure that the disposal permit is current. Only JPG's asbestos waste can be disposed of on the landfill.

g. Record the weight of asbestos buried and source building before disposal and submit the information to the asbestos coordinator for EPA/State records.

7. VEHICLES BRAKES, CLUTCHES, AND RELATED COMPONENTS SERVICING -

a. Procedures for brake servicing.

(1) Position vehicle in an area designated for brake servicing. Insure that there is no strong cross-draft ventilation through the work area which could cause the asbestos fibers to be blown into the air before it is wet.

(2) Fill an air-less sprayer with a mixture of 2 gallons of water and 8 ounces of floor soap. Adjust the spray nozzle to obtain a fine conical spray. (NOTE: Do not use a concentrated stream because it will cause the fibers to become air-borne.)

(3) Insure that individuals performing the work wear approved asbestos respirator.

(4) Remove wheel and drum from vehicle using the wheel lifting dolly. Exercise care not to disturb the accumulated dust on the brake and drum assembly.

(5) Position the drip pan under the component to be washed to capture all drippings.

(6) Using a fine conical spray on the sprayer, gently wash down the drum, brake shoes and backing plate of all dust particles. While doing this, take care to catch all drippings in the drip pan. Do not at any time use a brush or other mechanical means to assist the spray solution in cleaning the brake components.

(7) Repeat this procedure for remaining wheels. Transfer any overflow of wash drippings from drip pan to bucket.

(8) Allow brake components to air dry before proceeding with normal brake or wheel servicing in accordance with appropriate procedures. (NOTE: Do not use compressed air for drying.)

(9) Collect all wash drippings in a fiber drum and coordinatewith the installation asbestos coordinator to dispose of it in the Gate 19 landfill.

B. Procedures for Clutch Servicing.

(1) Follow procedures outlined in subparagraphs 7a(1) through (3) above.

(2) Follow appropriate procedures for removing clutch assembly up to the point where clutch housing is to be broken away from the engine.

(3) Separate the clutch housing from engine by inching it slowly away. While doing this, wash the edge of housing and exposed clutch parts with the spray solution. Take care to capture all drippings in pan.

(4) Completely remove the clutch housing and finish washing all components of asbestos fibers.

(5) Allow components to air-dry and complete required maintenance.

(6) Dispose of wash drippings IAW subparagraph 7b(9) above.

c. Procedures for handling asbestos brake or clutch components and other products manufactured from asbestos.

(1) If at all possible, stock sheet asbestos gasket should not be used and stored in unit/activity supply rooms. It is better that preformed ready-made packaged asbestos gaskets be requisitioned and used. If the need arises that require the use of stock sheet asbestos gasket, all handling and cutting of this material must be done in the wet state. This is accomplished by immersing the material in water and when thoroughly wet, cutting or forming may be done without releasing fibers into the air. Storage of stock sheet asbestos gasket in supply rooms is accomplished by placing it in a plastic bag capable of being sealed.

(2) Unpackaging of any asbestos products, such as brake shoes, clutch disks, and preformed gaskets should be done while immersed in a bucket of water to contain the fibers. These products can be readily used for their intended purpose while wet without any problem. There is no need to wait for them to dry out.

(3) Dispose of contaminated water IAW subparagraph 7b(9) above.

SECTION IV

REFERENCES

1. 29 CFR 1910.1001, OSHA Industry Standard

2. 29 CFR 1926.58, OSHA Construction Standard

3. Public Law 99-519, Asbestos Hazard Emergency Response Act (AHERA) of 1986.

4. 40 CFR 763, Subpart F, Friable Asbestos Containing Materials in Schools.

5. 29 CFR 1910.134, Respiratory Protection.

6. TB Med 513, Guidelines for the Evaluation and Control of Asbestos Exposure, 15 December 1986.

DISTRIBUTION
6 - STEJP-EH-B
6 - STEJP-EH-U
3 - STEJP-B,G,U
1 - Director, Eng &Hsg
6 - Equip Mgt Div
1 - Safety & Health Officer
3 - Environmental Engineer's File

APPENDIX 8
INVENTORY OF UNDERGROUND STORAGE TANKS

U.S. ARMY JEFFERSON PROVING GROUND
UNDERGROUND PETROLEUM STORAGE TANKS
(UPDATED 23 SEP 88)

*-Not known-Assumed steel w/ 2 paint coats

BLDG. LOC	CAPA-CITY	INSTAL-LATION YEAR	FUEL TYPE	TANK MATER-IAL	ACT-TIVE	PERM.	TEMP.	TEST-ED	REG. IN	STATUS	REMOVE	REPLACE	LOCATION DWG 8012-800
Bldg - 1	500	*	FO#2	*	yes			/ /	no				1-1000-#2
Bldg.- 2	500	*	FO#2	*	yes			/ /	no				1-500
Bldg-3	500	*	FO#2	*	yes			/ /	no				1-500
Bldg-7	500	*	FO#2	*	yes			/ /	no				1-500
Bldg-8	500	*	FO#2	*	yes			/ /	no				1-500
Bldg-11	500	Bldg does not exist	FO#2	*	yes			/ /	no				1-500
Bldg-12	500	*	FO#2	*	yes			/ /	no				1-500
Bldg-15	500	*	FO#2	*	yes			/ /	no				1-500
Bldg-16	500	*	FO#2	*	yes			/ /	no				1-500
Bldg-17	500	*	FO#2	*	yes			/ /	no				1-500
Bldg-20	500	*	FO#2	*	yes			/ /	no				1-500
Bldg-21	500	*	FO#2	*	yes			/ /	no				1-500
Bldg-23	500	*	FO#2	*	yes			/ /	no				1-500
Bldg-33	1000	*	FO#2	*	yes			/ /	no				1-1000-#2
Bldg-103	25000	1941	FO#2	Steel	yes			06/29/84	yes				4-25000-6
	25000	1941	FO#2	Steel	yes			07/02/84	yes				
	25000	1952	FO#2	Steel	yes			07/03/84	yes				
	25000	1952	FO#2	Steel	yes			07/06/84	yes				
	550	1985	Diesel #2	Steel	yes			/ /	yes				
Bldg-118	12000	1942	Unlead gas	Steel	yes			06/22/84	yes				
	12000	1942	Unlead gas	Steel	yes			03/11/86	yes				
	12000	1942	Diesel	Steel	yes			03/13/86	yes				
	25000	1942	FO#2	Steel	yes			06/26/84	yes				
	1000	1952	Lead gas	Steel	yes			06/21/84	yes				
	1000	1952	FO#2	Steel			X	/ /	yes		X		
	675	1943	Kerosene			X		/ /	yes		X		
	550	1943	White gas			X		/ /	yes		X		
	550	1943	FO#1			X		/ /	yes		X		
Bldg-125	1000	1941	FO#2	*	yes			/ /	no			X	1-1000-#2
Bldg-127	1000	1941	FO#2	*	yes			/ /	no			X	2-1000-#2
Bldg-149	500	*	FO#2	*	yes			/ /	no				1-500
Bldg-154	300	1968	FO#2	Steel				/ /	yes				?
Bldg-156	1000	1983	FO#2	Steel	yes			/ /	yes				No Lust
Bldg-184	300	1968	FO#2	Steel	yes			/ /	yes				No Bldg.
Bldg-186	1000	1983	u. m. oil	Steel				/ /	yes				No Lust
Bldg-189	500	1953	FO#2	*	yes			/ /	no			X	1-560-#2
	500	1953	FO#2	*	yes			/ /	no			X	1-1000-#2
Bldg-214	500	1942	FO#2	*	yes			/ /	no			X	1-500-#2
Bldg-236	1000	1943	FO#2	*	yes			/ /	no			X	1-1000-#2
Bldg-265	500	1941	FO#2	*	yes			/ /	no				1-564-#2
Bldg-266	500	1941	FO#2	*	yes			/ /	no				1-564-#2
Bldg-281	500	1942	FO#2	*	yes			/ /	no				1-300-#1
Bldg-291	0	1943	FO#2	Steel		X		/ /	no	Contr.Removed Nov 88	X		1-564-#2
Bldg-291	0	1943	FO#2	Steel		X		/ /	no	Contr.Removed Nov 88	X		2-12500
Bldg-310	0	1941	FO#2	Steel		X		06/11/84	yes	Contr.Removed Nov 88	X		1-25000-6

U.S. ARMY JEFFERSON PROVING GROUND
UNDERGROUND PETROLEUM STORAGE TANKS
(UPDATED 23 SEP 88)

*-Not known-Assumed steel w/ 2 paint coats

BLDG. LOC	CAPA-CITY	INSTAL-LATION YEAR	FUEL TYPE	TANK MATER-IAL	ACT-TIVE	PERM.	TEMP.	TEST-ED	REG. IN	STATUS	REMOVE	REPLACE	LOCATION DW 8012-800
Bldg-303	0	1941	FO#2	Steel		X		06/11/84	yes	Contr.Removed Nov 88	X		2-25000-2
Bldg-303	0	1941	FO#2	Steel		X		06/12/84	yes	Contr.Removed Nov 88	X		at B303
Bldg-313	1000	1941	FO#2	*	yes			/ /	no			X	1-1000-#2
Bldg-322	1000	1942	FO#2	*	yes			/ /	no			X	1-1000-#2
Bldg-325	1000	1953	FO#2	*	yes			/ /	no			X	1-2000-#2
Bldg-333	10000	1975	FO#2	Steel	yes			06/08/84	yes				1-10000-2
Bldg-481	1000	1941	FO#2	*	yes			/ /	no			X	
Bldg-488	500	*	FO#2	*	yes			/ /	no				
Bldg-510	500	1941	FO#2	Steel	yes			/ /	no				1-564-gal
Bldg-530	4000	1978	FO#2	Steel	yes			/ /	yes				1-1000-#2
Bldg-602	25000	1952	FO#2	Steel			X	/ /	yes				2-25000-6
Bldg-602	0	1952	FO#2	Steel		X		/ /	yes	Contr.Removed Nov 88	X		
Bldg-602	0	*	FO#2	Steel	yes	X		06/18/84	yes	Contr.Removed Nov 88	X		no listed
Bldg-617	25000	*	FO#2	Steel	yes			06/19/84	yes				
	0	1952	FO#2	Steel			X	/ /	yes	Contr.Rmeoved Nov 88	X		2-25000-6
	0	1952	FO#2	Steel			X	/ /	yes	Contr.Removed Nov 88	X		2-25000-6
	0		FO#1	Steel		X		/ /	?	Contr.Removed Nov 88	X		no listed
Bldg-227	1000							/ /					1-1000sol
Bldg-202	350							/ /					1-350-#2
	0							/ /					

A. UNDERGROUND STORAGE TANKS IN ACTIVE USE (Sept 1987)

LOCATION	CAPACITY(gal)	INSTALLED	FUEL TYPE	MATERIAL	REGISTERED
B-602	1,000	*	FO#2	steel	yes
B-617	25,000	*	FO#2	steel	yes
B-103	25,000	1941	FO#2	steel	yes
	25,000	1941	FO#2	steel	yes
	25,000	1952	FO#2	steel	yes
	25,000	1952	FO#2	steel	yes
	550	1985	Diesel Fuel#2	steel	yes
B-333	10,000	1975	FO#2	steel	yes
B-530	4,000	1978	FO#2	steel	yes
B-156	1,000	1983	FO#2	steel	yes
B-184	300	1968	FO#2	steel	yes
B-118	12,000	1942	Unleaded gas	steel	yes
	12,000	1942	Unleaded gas	steel	yes
	12,000	1942	Diesel fuel	steel	yes
	25,000	1942	FO#2	steel	yes
	1,000	1952	Leaded gas	steel	yes
B-236	1,000	1943	FO#2	*	no
B-125	1,000	1941	FO#2	*	no
B-313	1,000	1941	FO#2	*	no
B-481	1,000	1941	FO#2	*	no
B-488	500	*	FO#2	*	no
B-33	1,000	*	FO#2	*	no
B-127	1,000	1941	FO#2	*	no
B-325	1,000	1953	FO#2	*	no
B-189	500	1953	FO#2	*	no
	500	1953	FO#2	*	no
B-211	500	1942	FO#2	*	no
B-149	500	*	FO#2	*	no
B-322	1,000	1942	FO#2	*	no
B-281	500	1942	FO#2	*	no

B-23	500	*	FO#2	*	no
B-21	500	*	FO#2	*	no
B-17	500	*	FO#2	*	no
B-15	500	*	FO#2	*	no
B-11	500	Bldg. does not exist	FO#2	*	no
B-7	500	*	FO#2	*	no
B-3	500	*	FO#2	*	no
B-1	500	*	FO#2	*	no
B-2	500	*	FO#2	*	no
B-8	500	*	FO#2	*	no
B-12	500	*	FO#2	*	no
B-16	500	*	FO#2	*	no
B-20	500	*	FO#2	*	no
B-510	500	1941	FO#2	*	no
B-266	500	1941	FO#2	*	no
B-265	500	1941	FO#2	*	no

* Unknown at current time

B. UNDERGROUND STORAGE TANKS OUT OF SERVICE PERMANENTLY (Sept 1987)

LOCATION	CAPACITY(gal)	INSTALLED	FUEL TYPE	DATE TAKEN OUT OF SERVICE
B-118	625	1943	KEROSENE (registered w/ state)	
	550	1943	White gas(registered)	
	550	1943	FO#1(registered)	
B-291	14,000	1943	B-291's tanks not registered	
	14,000	1943	with the state	

C. UNDERGROUND STORAGE TANKS TEMPORARILY OUT OF SERVICE

LOCATION	CAPACITY(gal)	INSTALLED	FUEL TYPE	MATERIAL	REGISTERED
B-602	25,000	1952	FO#2	steel	yes
	25,000	1952	FO#2	steel	yes
B-617	25,000	1952	FO#2	steel	yes
	25,000	1952	FO#2	steel	yes
B-310	25,000	1941	FO#2	steel	yes
AIRPORT	25,000	1941	FO#2	steel	yes
	25,000	1941	FO#2	steel	yes
B-118	1,000	1952	FO#2	steel	yes

D. UNDERGROUND STORAGE TANKS PRESSURE TESTED

LOCATION	CAPACITY(gal)	INSTALLED	FUEL TYPE	DATE TESTED	REGISTERED
B-333	10,000	1975	FO#2	6/08/84	yes
B-310	25,000	1941	FO#2	6/11/84	yes
AIRPORT	25,000	1941	FO#2	6/11/84	yes
	25,000	1941	FO#2	6/12/84	yes
B-602	1,000	*	FO#2	6/18/84	yes
B-617	25,000	*	FO#2	6/19/84	yes
B-118	12,000	1942	Unleaded gas	6/22/84	yes
	12,000	1942	Unleaded gas	3/11/86	yes
	12,000	1942	Diesel Fuel #2	3/13/86	yes
	25,000	1952	FO#2	6/26/84	yes
	1,000	1952	Leaded gas	6/21/84	yes
B-103	25,000	1941	FO#2	6/29/84	yes
	25,000	1941	FO#2	7/02/84	yes
	25,000	1952	FO#2	7/03/84	yes
	25,000	1952	FO#2	7/06/84	yes

E. UNDERGROUND STORAGE TANKS NOT REGISTERED WITH THE STATE OF INDIANA

LOCATION	CAPACITY	INSTALLED	MATERIAL++	FUEL TYPE
B-236	1,000	1943	steel	FO#2
B-125	1,000	1941	steel	FO#2
B-313	1,000	1941	steel	FO#2
B-291	14,000	1943	steel	FO#2
	14,000	1943	steel	FO#2
B-481	1,000	1941	steel	FO#2
B-488	500	*	steel	FO#2
B-33	1,000	*	steel	FO#2
B-127	1,000	1941	steel	FO#2
B-325	1,000	1953	steel	FO#2
B-189	500	1953	steel	FO#2
	500	1953	steel	FO#2
B-211	500	1942	steel	FO#2
B-149	500	*	steel	FO#2
B-322	1,000	1942	steel	FO#2
B-281	500	1942	steel	FO#2
B-23	500	*	steel	FO#2
B-21	500	*	steel	FO#2
B-17	500	*	steel	FO#2
B-15	500	*	steel	FO#2
B-11	500	*	steel	FO#2
B-7	500	*	steel	FO#2
B-3	500	*	steel	FO#2
B-1	500	*	steel	FO#2
B-2	500	*	steel	FO#2
B-8	500	*	steel	FO#2
B-12	500	*	steel	FO#2

B-16	500	*	steel	FO#2
B-20	500	*	steel	FO#2
B-510	500	1941	steel	FO#2
B-266	500	1941	steel	FO#2
B-265	500	1941	steel	FO#2

++ ASSUMED TO BE CONSTRUCTED OF STEEL AND TWICE PAINT COATED.

F. UNDERGROUND STORAGE TANKS REGISTERED IN INDIANA

* UNKNOWN AT CURRENT TIME

LOCATION	CAPACITY(gal)	INSTALLED	MATERIAL	FUEL TYPE
B-602	25,000	1952	steel	FO#2
	25,000	1952	steel	FO#2
	1,000	*	*	FO#2
B-617	25,000	1952	steel	FO#2
	25,000	1952	steel	FO#2
	25,000	*	steel	FO#2
B-310	25,000	1941	steel	FO#2
AIRPORT	25,000	1941	steel	FO#2
	25,000	1941	steel	FO#2
B-103	25,000	1941	steel	FO#2
	25,000	1941	steel	FO#2
	25,000	1952	steel	FO#2
	25,000	1952	steel	FO#2
	550	1985	steel	Diesel Fuel #2
B-333	10,000	1975	steel	FO#2
B-530	4,000	1978	steel	FO#2
B-186	1,000	1983	steel	used motor oil
B-154	300	1968	steel	FO#2
B-118	12,000	1942	steel	Unleaded gas
	12,000	1942	steel	Unleaded gas
	12,000	1942	steel	Diesel Fuel #2
	25,000	1952	steel	FO#2
	675	1943	steel	Kerosene
	550	1943	steel	White Gas
	550	1943	steel	FO#1
	1,000	1952	steel	Leaded gas
	1,000	1952	steel	FO#2

SUMMARY:

TOTAL NUMBER OF STORAGE TANKS = 59
STORAGE TANKS IN OPERATION = 46
STORAGE TANKS NOT IN OPERATION = 13
STORAGE TANKS REGISTERED WITH STATE = 27
STORAGE TNAKS NOT REGISTERED WITH STATE = 32